

History of Irrigation and Agriculture In The Land of the Two Rivers

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This Book is dedicated to the People of Iraq
Recalling the words of Confucius
“Study the Past if you define the Future”

Statement

*While I was writing this book, my friend Dr Nadhir al- Ansari
Undertook and spared no effort in reviewing of its manuscripts for which
I am indebted*

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Prelude:

Writing history is not an easy or simple task. Even historians normally approach it with caution and care to put the events in the correct perspective in time and setting. Trying to read history of a particular historical event and drawing the right conclusions is, however, an even more difficult work. Different motives may lay behind writing the history of a particular event which necessitates looking into it from different angles and trying to reach an unbiased conclusion.

When I decided to write on the history of “Irrigation and Agriculture of the Land between the two Rivers” as an engineer, I thought that the problems involved are insurmountable, and maybe I should leave it to others. The challenge was very strong, and finally I decided to take it. The real problem was not in the absence of references, but on the contrary, there were so many of them that they needed to be scrutinized carefully. Archeologists who had dug in hundreds of sites in Iraq were so many, and their writings were so bulky for their work spanned well over hundred and fifty years. Many historians have also produced thousands of pages on the subject. In selecting resources, much weight had to be placed on primary older references whenever available. In all cases, I have listed the websites in which these resources are found; which is in conformity with the present day intensive use of the internet to allow readers and researchers to refer back to these original sources for more details.

Following the advice of an old history teacher, I have attempted to analyze the theme of agriculture in Mesopotamia in its relation to irrigation, and their interactions with the social settings and environmental and political background. So in so many places of the book the reader finds descriptions of these social settings and political backgrounds which were thought to be necessary. Mellissa Rosenzweig states rightly “Standard treatments of ancient agriculture provide information on subsistence and economy, but archaeologies of agriculture can also engage with politics in the past. This approach requires theorizing the role that environmental practices play in constituting political associations, and appreciating the land-use as a ubiquitous and therefore, integral social locus for the negotiation of political relationships” ⁽¹⁾.

Another important area to which my attention was drawn was following the correct chronology; the old history teacher had recommended taking a special care of the “When”. In many references, I was faced with conflicting dates for the same event. In such cases, it was inevitable to compare more than one source to reach the correct and trustworthy information. In dating historical events, I have selected the BC, AD system indicating, before and after birth of Christ. In addition, in so doing, I endeavored to change all the dates based on the CE (Current Era), BCE (Before the Current Era) back to the first one. This was done for the sake of uniformity, on the one hand, and also based on my firm belief that referring to the birth of

Christ as bench mark in history gives a much clearer time frame. Otherwise, this leaves the unfamiliar reader in perplexity to the meaning of CE and BCE; for again you have to explain that the (Current Era) is nothing more than after Christ while BCE is before Christ.

Again, and for the same reason of consistency, I was faced with the cumbersome work in converting all the dates given in the Hijri calendar, in which all Muslim scholars of the Islamic era had used in their writings of the Islamic era, to the corresponding dates in the Gregorian calendar we use today.

Having taken care of the “When”, there still remained, however, the “Where, the Who and the why” to give a complete picture of any historical sequel, which I have tried to answer to. In the context of these four important articles, I have attempted to present to the reader a narrative of the development of irrigation and agriculture in the land between the Tigris and Euphrates to the best of my humble abilities.

Iraq or the Mesopotamia of the past has been described often as the cradle of civilization. Peoples that inhabited this land had developed skills and arts to a high degree of refinement that they may be considered as the early builders of human civilization. Societies and States here were developed based on a stable way of life, unlike many other communities of their predecessors who were shifting from one place to another looking for their means of living. In Iraq, people did not invent agriculture, but they may have been among

the first peoples who developed irrigated agriculture in which they excelled. In this, they were supported by the rich water resources of the Tigris and Euphrates Rivers, which did not only provide them with a permanent supply of water, but added also fertility to the land every year by the rich mineral sediments they carried every flood season. Our knowledge of this past is enhanced by the archeological findings, and of the inscriptions on the clay tablets made by the Sumerian scribes who had recorded every day's events and passed them to us. Indeed, they were the first inventors of writing; their cuneiform script was the first known form of writing in the world, and so they were indeed the first authors of written history.

One writer states, “civilization is a producing society that has writing and city life” ⁽²⁾. For these reasons and not any other reasons, another historian states that “history begins at Sumer” ⁽³⁾. If we take this statement as our basis, then all the tens of thousands of years that preceded this baseline may be called prehistory. To put the history of water works in Iraq in the right perspective it is necessary; therefore, to look carefully into the development of agriculture, which is the most important user of water, and to make a start right at Prehistory.

This is done in this book in a chronological order, and so it is divided into eleven chapters, in which each chapter deals with a specific period characterized by the main actors on the scene. A special effort is made however, to keep the continuity of events

between the chapters to indicate the transitions taking place in the long timeline of Mesopotamia.

Chapter 1; deals with prehistory and the long strides taken by mankind for hundred thousands of years to come at the end to the stage that we can call history, whereby man could communicate in writing, opening the door for the first Ancient Civilization in the World, which is the Sumerian Civilization. As for the other chapters, I leave it to the reader to follow for themselves.

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Part I
Mesopotamia

The Land between the Two Rivers

“Herodotus”

Man's First Strides (The Prehistoric Era)

The terms “History” and “Pre-history” are linked together in the narration of changes and continuity of the human past over time. By “Pre-history” it is meant the recovery of knowledge of the past in an area where no written records exist. Such knowledge may be derived however from studying paintings, drawings, carvings, and other artifacts left by the prehistoric people. This definition suggests clearly that “History” which again studies the human past depends on the existence of written records in addition to the above mentioned tools. As such we may state that “History” begins with the appearance of the oldest form of writing, which is the “Cuneiform” invented by the Sumerians 3200 BC. This justifies the title of the book authored by Kramer, “History Begins in Sumer” ⁽¹⁾.

In the long time-line of prehistory as seen by historian's certain land marks may be selected to define some of the turning points in the development of mankind and pin point some of the major changes in this development, which are related to our subject. The reader may be referred to the complete prehistoric time- line in Wikipedia ⁽²⁾ detailed information. It is very interesting to note that Man “*Homo Sapiens*” first appeared in Africa 200,000 years ago where climatic conditions were favorable while vast ice sheets were covering much of North America, Northern Europe, and Asia. The last Glacial Maximum over these parts was about 26,000 years ago and deglaciation in the northern hemisphere only commenced at about 20,000 years ago. The humid period began at 14,800 years in North Africa. The region

known later on as the Sahara, and similarly the Arabian Peninsula were wet and fertile and aquifers were full. In northern Mesopotamia 10,000- 9,000 years ago cultivation of barley and wheat began. At first, they were used for beer, gruel, and soup, eventually for bread. In early agriculture at this time, the planting stick was used, but it was replaced by a primitive plow in subsequent centuries. Later on between 8,200 and 8,000 years ago a sudden decrease of global temperatures led to drier conditions in East Africa and the Arabian Peninsula. Civilizations developed in the Mesopotamia/Fertile Crescent region 6,000 years ago (4000 BC) and the region began to see migrations from the Arabian Peninsula at about (3900 BC) due to rapid and intense dry phase, which began there. At that time, Ubaid culture was predominant in Mesopotamia. Later on Sumerians of the Uruk period continued the Ubaid culture and built on it in Southern Mesopotamia (3750 -3150 BC), followed by the next Sumerian Period of Jemdet Nasr (3150- 2900BC). These periods saw the emergence of urban life in Mesopotamia, which flourished later on to form the Sumerian civilization. It was then and there when writing was invented, triggering the beginning of recorded history.

In the preceding lines, the impact of climatic changes on the history of our planet Earth was given from the historians' point of view. About the geologic aspect of the same, geologists talk of the "*Holocene*" as being the current geological epoch that began about 11,700 years ago. This epoch, it is thought to be the longest warm and "stable" climatic period of the last 400,000 years which may have

played a significant role in facilitating the development of human civilization. Being so it encompasses the advent of agriculture and the birth and spread of civilizations during our human history. In supporting evidence of this development, the geological findings from Greenland ice measurements of oxygen isotopes indicate that the last ice age ended about 11000 BC and suggests that the extreme cold period ended about 9000BC ⁽³⁾, Figure (1).

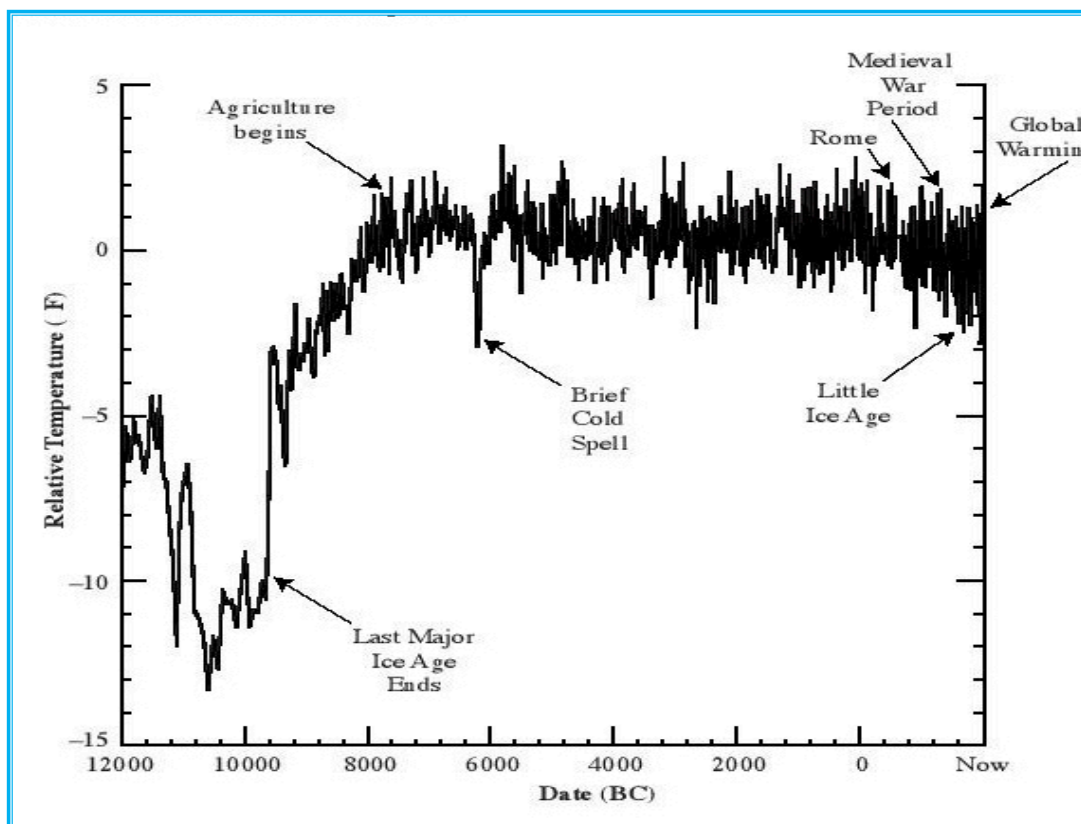


Figure 1: Temperature from 12,000(BC) to the present from Greenland ice measurements of Oxygen isotopes ⁽³⁾.

In a book titled “The Evolution of Civilization- an Introduction to Historic Analysis” ⁽⁴⁾, the author divides the development of human society throughout history into stages whereby the first stage was marked by roaming individuals of food collectors who in later stage

aggregated into wandering groups of hunters and food collectors. In a still later stage these wandering groups had to settle but their style of life did not change much, and they still depended for their subsistence on collecting food and hunting, which deserved them the description of “Parasitic” societies. The final stage of this development was reached when these societies became producing societies by practicing agriculture and animal husbandry. The same author goes on to state that the western civilization is the descendant of what he calls the “Grain Civilization” indicating the type of agricultural product grown by this civilization, which prevailed in Western Asia, in contrast to the “Maize Civilization” in South America and the “Rice Civilization” in the far east. This “Grain Civilization” being the oldest of all civilizations may have started probably not far from Armenia about nine thousand years ago. Because these people knew nothing about replenishing the fertility of soil, they practiced “shifting cultivation” moving to new fields when yield declined in their old fields. In this course of movement they found in various alluvial river valleys sites adapted to permanent large scale settlements. In addition, in such valleys, the annual flood replenished the fertility of the soil by depositing a layer of fertile sediment. Accordingly, the need for “shifting cultivation” ended and the possibility of permanent, eventually urban, settlements was offered. This possibility was realized in four alluvial valleys of the Old World, in Mesopotamia during the six millennium BC, in the Nile valley shortly afterwards, in the Indus River valley early in the third millennium BC, and in the

Huang Ho Valley of China late in the third millennium BC. Mesopotamia, which means, "the land between the rivers" was the name given by Herodotus (484-425BC) the Greek historian to the land between the Tigris and Euphrates Rivers in Iraq and northeastern Syria. An example of the "shifting cultivation" was revealed by the archeological excavations in Göbekli Tepe, an archaeological site in the Southeastern Anatolia Region of Turkey, approximately 12 km northeast of the city of Şanlıurfa close to the Euphrates River. The advent of agriculture and animal husbandry brought new realities to human life in the area, at about the beginning of the 8th millennium BC⁽⁵⁾. The development of irrigated agriculture in Southern Mesopotamia, however, seems to be an issue of conflict between historians. While Kramer ⁽¹⁾ gives full credit of this to the Sumerians, another theory held by Sousa ⁽⁶⁾ gives a different story. He claims that after the end of the last ice age at about 15000 years ago at times when the present days' Arabian Peninsula was flourishing region, a new period of long draught had followed. It compelled the inhabitants, all of them from the Semitic Race, to immigrate towards the north and settle in northern Mesopotamia in Syria at about 9000 BC. These people already had some knowledge of the irrigated agriculture techniques and animal husbandry.

At a later stage, some of these people moved towards the southern part of Mesopotamia where the land was more fertile and water resources of the two rivers were abundant, and according to Sussa these Simetic people were the ones who had the credit of

introducing irrigated agriculture in Southern Mesopotamia. Sousa claims however may not be correct, as excavations had shown that other people which historians have called Al- Ubaid had already inhabited the area. On their origin they did not have enough knowledge, but similar to the Sumerians they were definitely not Semitic. These people also practiced irrigated agriculture. So it seems that irrigation agriculture was firmly established by these people in the southern part of Mesopotamia before the gradual movement of the Aryan Sumerians into the region around (4000BC -3000BC).

The Sumerians had first inhabited the marshes of southern Iraq after their immigration from most probably Elam at the western part of the present day Iran, or from an area located between North India, Afghanistan and Baluchistan and settled first in Bahrain after crossing the sea before moving to Iraq. The Sumerians intermingled with these Al- Ubaid in their cities for quite a long time before everything took up the Sumerian culture as the dominant culture of the land. The Semitic Culture seemed to have a presence at some time afterwards.

Sousa quotes from the writings of the German archeologist Anton Mortgate, who had worked in archeological sites in Iraq (1920, 1930) and became the director of Berlin Museum and later, professor of ancient history of the Near East in Berlin University since 1947. He stated that the transition to the pure Sumerian culture took a long period. He believed that the cuneiform writing had developed during a period of about 700 years (3500- 2800 BC) from a pictographic form containing symbols, shapes and pictures, which may be called

(Protoliterate) to a more symbolic form then to reach finally the vocal type of writing of the cuneiform. While we agree with all the historians that the Sumerians were the founders of the first ancient great civilization, nobody can deny the role of Al- Ubaid in laying down the foundations of the Sumerian Civilization itself.

The period, which is normally tagged after the Ubaid culture, extended from 6500 BC to 3800 BC. It was the prehistoric period preceding the development of the Sumerian culture. The name was derived from the first discovery of its presence during the excavation of Tell al- Ubaid near the old city of Ur at the extreme Southern Mesopotamian delta. It seems, however, that the Al- Ubaid culture was built on the remains of a previous obscure culture named the “Halafians” which archeologist link with Anatolia, and the lack of rupture between the “Halafians” and “Ubaidans” cultures suggest peaceful transition.

Historians and archaeologists used the term Ubaid, however, to indicate the practices of people spread over a wide area in the near east; in Turkey and Syria and later on in Southern Mesopotamia. This term was mainly linked to the type of pottery discovered over sites in the region which had similar characteristics, but according to Carter ⁽⁷⁾ the Ubaid did not only have regional manifestations, but also hybrid origins. In Figure (2) the locations of the Ubaid settlements in Turkey, Syria and upper part of Mesopotamia are shown, but for the purpose of this work emphasis is put mainly on the Ubaid settled in

Southern Mesopotamia. The “heartland” of Ubaid was centered in Ur, Eridu, Tell Oueili, and Uruk, Figure (3).

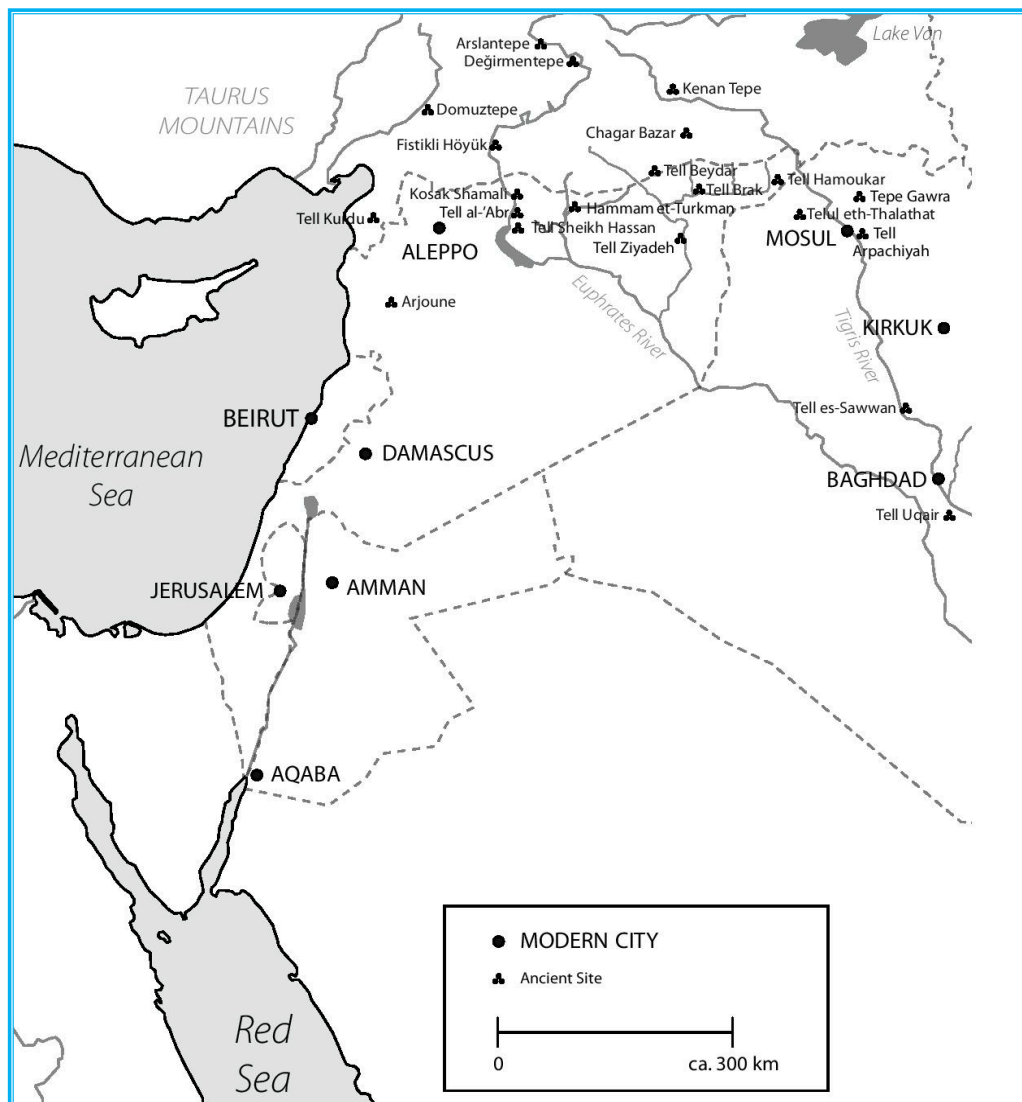


Figure 2: Ancient Ubaid Settlements in Turkey, Syria and upper Mesopotamia ⁽⁷⁾.

In the development of the Ubaid culture in Southern Mesopotamia, four stages can be observed, which may be described as follows:

Ubaid 0: (6500- 5400BC). This is the earliest Ubaid phase which was excavated in Tel al Ubaid.

Ubaid 1: (5400- 4700BC). Which is also called Eridu phase in connection with Eridu city.

This phase is limited to south of Iraq, on what was the shores of the Persian Gulf. This phase saw also the establishment of the first permanent settlements south of the 130 mm rainfall isohyets. The people in this phase pioneered the growing of grains in the extreme conditions of aridity, but they were helped by high water tables due to the proximity of the marshes and the gulf. In one, striking finds in “Tell Al-Oueili” the French Archeologists Roux came across carefully constructed mud- brick houses together with dozens of small and square pits surrounded by thin walls “tauf” which were interpreted as infrastructures to “granaries”. The village was in a flat region crisscrossed by shallow streams and partly marshy. The inhabitants domesticated zebus (A type of water buffalos) and pigs ⁽⁸⁾.

Ubaid 2: (4880- 4500BC). In this period the development of extensive canal networks was seen together with major settlements. Evidence from Choga Mami (4700- 4600BC), a site in Diyala province in middle Iraq at the Mandali region, indicated that irrigated agriculture had developed there and rapidly spread elsewhere. This development required collective effort and centralized coordination of labour in Mesopotamia.

Ubaid 3: In the Period (4500- 4000BC intensive and rapid urbanization was noticed with the Ubaid culture spreading to northern Mesopotamia. Ubaid artifacts were found spread over the whole region which also indicated the growth of a trading system that stretched from the Mediterranean coast through to Oman.



Figure 3: Ubaid Settlements in Southern Mesopotamia⁽⁷⁾.

The Ubaid culture was characterized by large village settlements without walls, and by multi-roomed rectangular mud- brick houses. Large settlement sites were around 10 hectares in area which were surrounded by smaller village sites of less than 1 hectare. The bulk of the population was agricultural laborers, farmers and seasonal pastoralists. Agriculture and animal husbandry were widely practiced in the permanent settlements, while nomadic tribes domesticated animals and were looking for pasture as far north as Turkey and Zagros mountains in the northeast.

Following this, a period of gradual transition from the Ubaid culture to a new period named after Uruk (Warka) took place. This period saw the emergence of urban life in Mesopotamia. It was followed by the Jemdet Nasr period which continued into the Early

Dynastic period of the Sumerian civilization. Uruk's growth was supported by its geographical location in the southern part of Mesopotamia on the Euphrates River.

The gradual and eventual domestication of native grain from the Zagros foothills (the Emmer strain grain) and the extensive irrigation techniques that were developed helped the area to support a vast variety of edible vegetation such as barley and rye in addition to grain⁽⁹⁾.

This domestication of grain and the proximity to rivers enabled Uruk's growth into the largest early Sumerian settlement, in both population and area.

The Uruk period is normally assigned by scholars to the period (4000–3200 BC) followed by the Jemdet- Nasr period (3100–2900 BC) which is considered only as one step higher up in the ladder of development. The names of these two periods were assigned in a conference on archeological findings, which was held in Baghdad in 1930. In spite of the fact that each period was tagged after the site of the town where particular type of pottery was salvaged, other aspects were similar. Uruk (Warka) was located close to the site of Ur, while Jemdet Nasr was located to the northeast of Uruk, about 80 km south of Baghdad within the area of Babylon. Differentiation between the two periods was based on the mass production of pottery, and the technology used in Jemdet- Nasr period as compared to that of Uruk. Both of these periods had shown a marked departure from the previous Ubaid period in the technological innovations, social life and

urbanization and the use of seals, bullae and cylinders, which were used to mark the potteries. The pictorial symbols used on these artifacts called the “*Protoliterate*” was the forerunner to the first form of writing that is “*Cuneiform*”.

According to some scholars, the transition from the Ubaid culture to the Uruk (Warka) culture took place, within the period (4000-3100BC). Others believe that this occurred from 3750 BC to 3150 BC. This slight variation shows that the divides between such ancient historical periods were always blurred; which puts emphasis on the transitional nature of changes of cultures. The chart in Figure (4) illustrates the chronological order of these periods as approximated by Pollock ⁽¹⁰⁾.

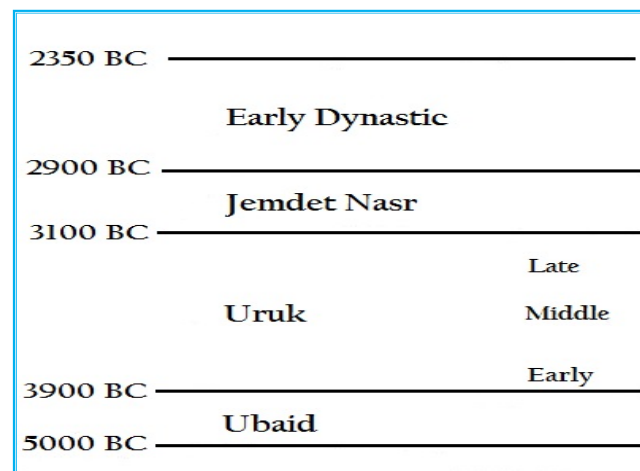


Figure 4: The Chronological order of the Periods from 5000 BC to 2350 BC ⁽¹⁰⁾.

Both cultures of Uruk and Jemdet- Nasr were basically agriculture dependent. Adams; however, repeatedly stressed the importance of pastoralism as another component of the distinctive Mesopotamian ecological adaptation ⁽¹¹⁾. He pointed out that in many ways pastoralism and agriculture represented complementary not

competitive strategies in the face of environmental realities. Vast areas of land that was not cultivated due to lack of irrigation water, nonetheless, provided adequate pasture for cattle herds during much of the year, and animals were also grazed on fallow lands. This and the technological advances and specialization of work witnessed during this era favored the concentration of population in large villages while the countryside was littered with hamlets supporting farming and pasteurizing. The abundant agricultural and animal products opened also new venues of trade to farther regions, and helped advance the pottery industry which produced various means of storing and exporting vessels for these products besides producing cooking and eating utensils and other tools. Through trade the influence of Uruk extended northwards and to the east with relative ease, Figure (5) gives an insight of such extent.



Figure 5: Location map of Uruk showing its area of influence.

Both Uruk and Jemdet- Nasr periods gave a strong drive towards urbanization as some of the villages grew into small towns due to the immigrants' flux. This was a direct result of work specialization and the appearance of such professions like traders, craftsmen and artisans so this process laid the foundation to the founding of city states of the next era of the Early Dynasties. This influx to small towns did not strain the rural population and did not endanger the sustainability of agriculture and pastoralism as more people converged on the area. In the winter of 1967, an archeological expedition led by Adams and Nissen embarked on a reconnaissance survey around the site of Uruk to study the hydrology, ecology and ancient irrigation system in an area of 2800 square kilometers. The work was concentrated on locating ancient settlements and the remains of old irrigation canals

from looking at the mounds and Tells littering the landscape. By examining artifacts left in these mounds, they could reach an estimate of the number and sizes of these settlements which are tabulated as in table (1) ⁽¹¹⁾.

Table 1: Settlement in Uruk area according types and period.

	Villages	Towns	Urban Centers	Cities
Early Dynastic II/ III	17	6	8	2
Early Dynastic I Gemdet- Nasr	124	20	2	1
Late Uruk	112	10	1	-
Early Uruk	17	3	1?	-

This table indicates clearly the growth of population in the area and their concentration in urban centers which reflects the degree of urbanization that took place and the development of more villages into towns at the height of Sumerian civilization in the II and III Dynastic periods. This also indicates the shifting of villages due to various reasons, which could have been; the control of irrigation water by upstream dwellers who could shut off water supplies from downstream users, drying up of some of the feeder canals as cited by Nissen ⁽¹²⁾, or may be due to clustering of villages together for defensive reasons, Figure (6).

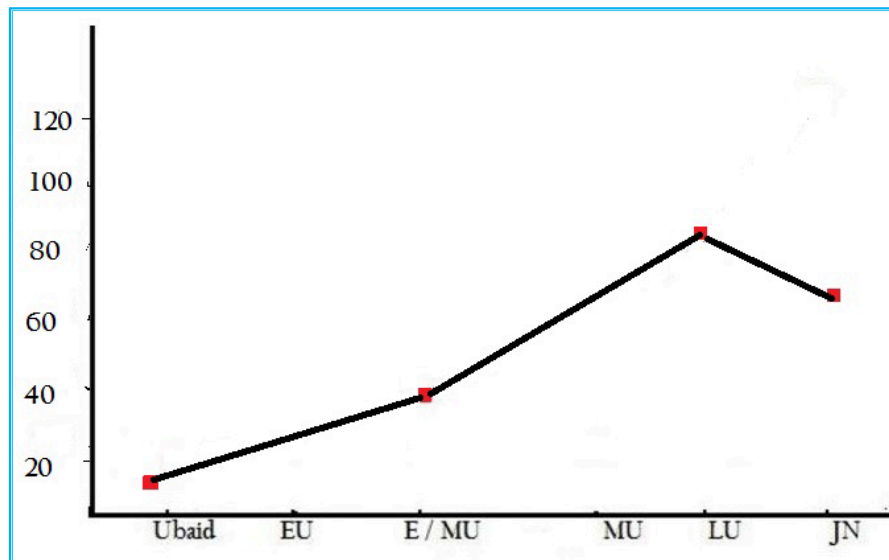


Figure 6: Number of settlements (on the Y- Axis), versus the Periods, Ubaid, EU (Early Uruk), E-/ M (Early Medium Uruk), LU / (Late Uruk), and JN (Jemdet- Nasr) ⁽¹¹⁾.

Adams ⁽¹¹⁾ gives also estimates of areas inhabited in hectares, which were reproduced by Pollock (1992), as shown in the diagram presented in figure, Figure (7).

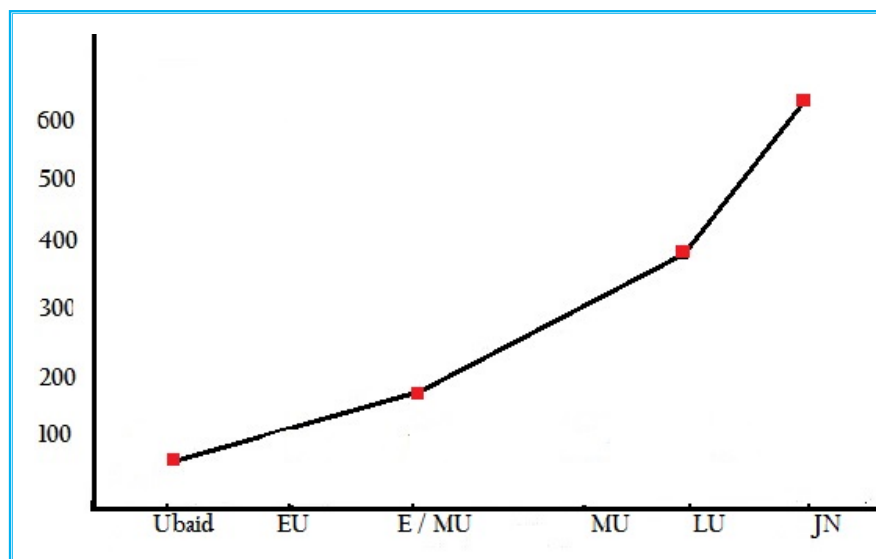


Figure 7: Total area of settlements in Hectares (on the Y- Axis), versus the Periods, Ubaid, EU (Early Uruk), E-/ M (Early Medium Uruk), LU / (Late Uruk), and JN (Jemdet- Nasr) ⁽¹¹⁾.

All these changes aggregated in the establishment and growth of city-states as a political and governance system and opened the door

wide open for the Sumerian civilization to flourish as the first civilization in human history.

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The Sumerians and the Akkadians -The Forerunners of the First Civilization (2900-2003BC)

During this very long period, many changes and developments occurred impacting on societies and ways of life in this important part of the ancient world. The volume of writings and research on this period is so tremendous that it can be summed up here only in a very concise and brief way and with the inevitability of leaving much of the details. It is also necessary to divide this era into periods according to the main actors in the Sumerian theatre. In all this, special emphasis is given on water and irrigation works that developed then, but due regard is also given to the background in which these developments occurred.

It is an established fact that the first successful efforts to control the flow of water on a very large scale were made in Mesopotamia. The Sumerians in southern Mesopotamia built city walls and temples and dug canals, which may be counted as some of the earlier of the world's first engineering works of their kind. It is also of interest to note that these people from the beginning of recorded history fought over water rights and agricultural land, and irrigation were extremely vital to them. Flooding problems were more serious in here than in Egypt because the Tigris and Euphrates were much swifter than the Nile and carried several times more silt per unit volume of water than

the Nile did. This resulted in rivers rising faster and changing their courses more often in Mesopotamia ⁽¹⁾.

The Sumerians had to solve much bigger hydraulic problems than the Egyptians whose civilization had not developed at that time yet. The processes leading to the Sumerian Civilisation cannot be understood except as creative adaptation to the priceless resources of the Tigris and Euphrates waters which led to this civilisation during the third millennia BC. The vigorous later traditions continued to build on assured food supply ensured by the two rivers. To study the full role of the two rivers in history one cannot but consider the whole geographic unit comprising their watershed area and their whole valley. Archaeological findings from Tell Bark on the Khabour tributary and from Ancient Mari on the Euphrates in Syria, which belonged to the third millennia and second millennia, showed the strong relationship between these parts of upper Mesopotamia in Syria and Lower Mesopotamia in Iraq. There were to be sure some periods when deep socio-political divisions extended across the two rivers during Parthians, Sasanian, the Umayyad and Abbasid empires. The valley of the two rivers, however, remained in other extended periods open for inter-regional contacts, and the banks of the Tigris and Euphrates were vital for heavily travelled routes between Mesopotamia and the world around the Mediterranean ⁽²⁾.

To follow things from where we left in Chapter 1, a brief account must be given to the history of the next period, which witnessed some of the most important changes in Mesopotamian history. A beginning

is made here with what we may call the “*Dawn of Civilization*” or the “*Early Dynastic Period (ED)*”, which generally dates to (2900–2350 BC) and had been preceded by the *Uruk* and-*Jemdet Nasr* periods. It saw the invention of the cuneiform text and the formation of the first city-state. This development ultimately led to the unification of much of Mesopotamia under the rule of Sargon, the first monarch of the Akkadian Empire. Despite this, the *early dynasties* city-states continued to share a relatively homogeneous material culture.

During the *early dynasties`* period, the *Sumerian* cities such as *Uruk*, *Ur*, *Lagash*, *Umma*, and *Nippur* located in Lower Mesopotamia, were very powerful and influential. To the north and west stretched states centred on cities such as *Kish*, *Mari*, *Nagar*, and *Ebla*. The population of *Ur*, which was one of Sumer's largest cities, has been estimated to have had 34,000 inhabitants at its peak, (See Appendix 3 of the inventory given by Modelski ⁽³⁾). Given the other city- states in Sumer and their large agricultural population, a rough estimation for Sumer’s population shows that it might have been somewhere between 200,000 and 260,000, (Appendix 1 of the same inventory). Agriculture in all this time continued to be the most important source of living for these city-states. The *early dynasties`* era ended by the accession of King *Sargon* to the throne of *Sumer* and *Akkad* and the unification of the *Sumerian* city-states into the *Akkadian* Empire and the inauguration of the *Akkadians* period (2350-2150BC).

The transition was very smooth and the mixture of the *Sumerian* and *Akkadian* cultures continued to flourish and then passed to the Neo- Dynasties of *Ur*, known as the *Ur* or *Ur III*. The period between The *Akkad* Dynasty and *Ur III* is not well documented. Most scholars believe that there was a short period of power struggle between the most powerful city-states after which the city of *Ur* rose to prominence during the period (2150- 2003BC), and so *Ur III* controlled the cities of *Isin*, *Larsa* and *Eshnunna* and extended as far north as *Jazira*. This glory ended at last at the hands of the *Gutian* invaders from the Zagros Mountains, whose kings ruled in Mesopotamia for an indeterminate period until the rise of *Babylonia*. These people were illiterate and nomadic, and their rule was not conducive to agriculture or developments in other fields.

During the long history of development in Mesopotamia, all the time the two rivers often spilt their flood waters over the banks into the surrounding plains. Their heavy loads of silt were deposited on these lands, but the coarser parts were deposited on the banks close to the rivers themselves and by so building higher grounds in the form of berms. As more silt was deposited on the bottom, the water level became increasingly higher than the adjacent land which helped the settlers along the rivers to use gravity irrigation and flood their fields to grow their needed food. And this is how *Sumerians*, *Akkadians* and later on the Babylonian civilisations constructed canals to carry the water further and extend the irrigated areas which helped these civilisations to flourish. It was only later on that they invented water-

lifting devices but only to be of limited use. Figure (8) illustrates a typical arrangement of the cultivated plots of land and how irrigation water is transferred to them (4).

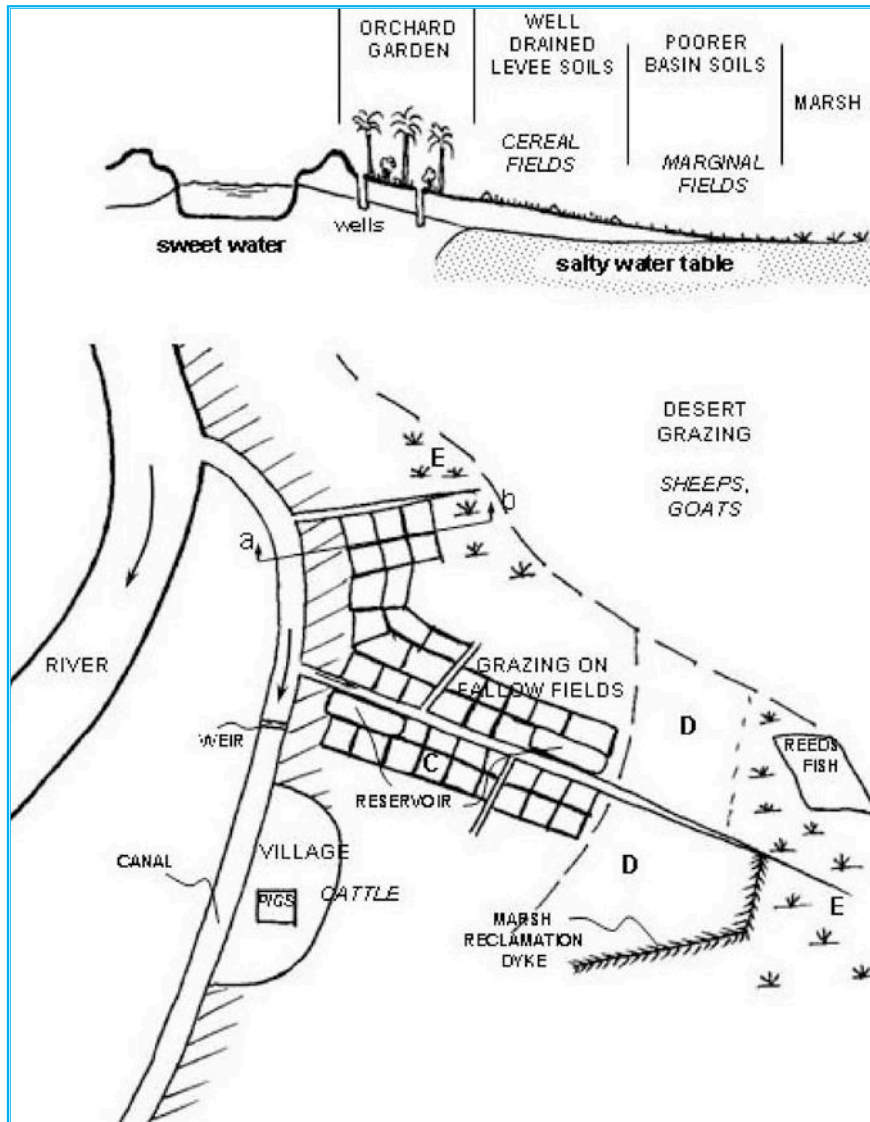


Figure 8: Hypothetical layout of an agricultural cell in south Mesopotamia

The two rivers, however, remained a source of constant danger to the people living along them as destructive floods were also frequent, which caused destruction and human losses. Such catastrophic floods together with wars obliterated some of these civilisations and opened the way for others. During all these times, the inhabitants had also to invent ways to protect themselves and their lands from flooding by

means of building dykes and learn how to close breaches in these dykes. High floods did not threaten the safety and the cultivations of the inhabitants only but also caused from time to time the shifting of the two rivers away from their original courses as characterised by fluvial rivers. The consequences were of such large magnitude that people had to abandon some of their flourishing cities since canals, and their intakes became obsolete. This meant building new cities, and new canal systems and new intakes to follow the new courses of these rivers.

The long history of Mesopotamia is full of such occurrences as discovered from archaeological excavations and the remnants of the old courses of the two rivers. As evidence for these changes, we may cite the fact that the Tigris and Euphrates at the Sumerian times did not meet as they do today to form Shatt-Al Arab, but they emptied separately in the Gulf as shown in Figure (9)⁽⁵⁾, a fact which underscores the changing nature of their watercourses. On the locations of the Sumerian settlements and city-states; more than often, these cities were established closer to the Euphrates River than to the Tigris, although the distance between the two rivers was not great in this delta as seen clearly from the map in Figure (9). The obvious reasons can be summarized. First, the general grade of land was in the direction from the Euphrates towards the Tigris which resulted in the irrigation networks' slope being in this direction toward the fertile lands below. Second, is the milder slope of The Euphrates River itself, which resulted in calmer flow and slower water level rise and

fall, making the construction of diversion works and canals off takes much easier. Finally, the Euphrates was characterized by much smaller flood volumes than the Tigris due to curtailment of the very high flood peaks by flooding upstream natural depressions such as *Al-Habaniyah* and *Abu Dibs* depressions whose excess water could replenish the Euphrates flow later on in the season.

In any study, which aims at the understanding of agricultural society of the Sumerians, it is very important to understand the social background of such societies. Social and governance system in Sumeria was based on the city-state system; whereby every city-state was sovereign and had its Deity, King, Temple, Priests, the Noblemen and the majority of the ordinary people who depended mostly on cultivating the agricultural land of the state; but there were also the Tradesmen, the Scribes and Artisans in addition to Slaves.

In most cases, irrigation water was carried to the cultivated lands by main canals, which were often shared between states. This gave rise to constant tensions, conflicts and even wars between these states over water rights, and at the same time encouraged some of the kings of these states to construct new canals and diversion works. The list of important city-states of *Sumeria* is long, and they belong to different periods; most important of these are *Ur*, *Eridu*, *Uruk*, *Girsu*, *Umma*, *Lagash*, and *Kish*, and history recorded to us some of the fierce wars between some of them.



Figure 9: Map Showing the Sumerian Heartland and Tigris and Euphrates estuaries.

In *Sumeria*, and generally in Lower Mesopotamia, the alluvial plains' agriculture was depended completely on irrigation in contrast to the upper Mesopotamia where dry farming was possible. For the inhabitants of Lower Mesopotamia irrigation had prime importance, and the control of water was decisive to ensure perpetual prosperity. Therefore, complex systems of canals, reservoirs, dykes, and control structures had to be planned and constructed to meet this end. Such works necessitated knowledge of hydraulic principles, which the *Sumerians* had developed and mastered in their applications. They dug canals, which followed the grade of the land so to have a smooth

flow and not to scour their bottoms or sides; some of these canals reached a width of 120 meters or large enough to permit navigation, and frequently such canals had levees or dykes. Sumerian texts described many of their canals and gave details of their lengths and dimensions. One of these described was 198 meters long canal, 1 meter wide and 0.25 m deep. In their irrigation networks, principal canals feed the smaller ones as clearly shown in Figure (8).

The description of an irrigation system which belonged to *Umma* mentioned one branch canal with depth of 0.5- 1 meter, and another having 6 m width with length reaching up to 1710 m. Secondary canals could be as wide as 1.00- 1.25 meter and 0.5- 2.25 meter in depth. The material from the excavation was probably used to raise the levees, increasing the canals depth. Although most of the received mathematical texts dealt with rectangular shaped canals, probably this was simplified of trapezoidal shape in order to facilitate quick computations for recording the daily progress during excavation as implied by these texts. On one tablet, two trapezoidal channels were presented, where the concept of side slopes was introduced, measured as the horizontal distance per 1 unit of length in the vertical. Side inclination in both canals was $V: H = 1:0.5$ ⁽⁴⁾.

In the intricate systems of irrigation, the *Sumerians* constructed control structures in the form of weirs across main streams to divert part of the flow into large lateral canal intakes, Figure (10). Such a weir consisted of two gates that can turn, blocking the river or the entrance to the canal depending on their positions. Probably they were

made of reeds and bitumen or, also wood. In more advanced works such as weirs were built with fire-baked clay bricks and earth ⁽⁶⁾.

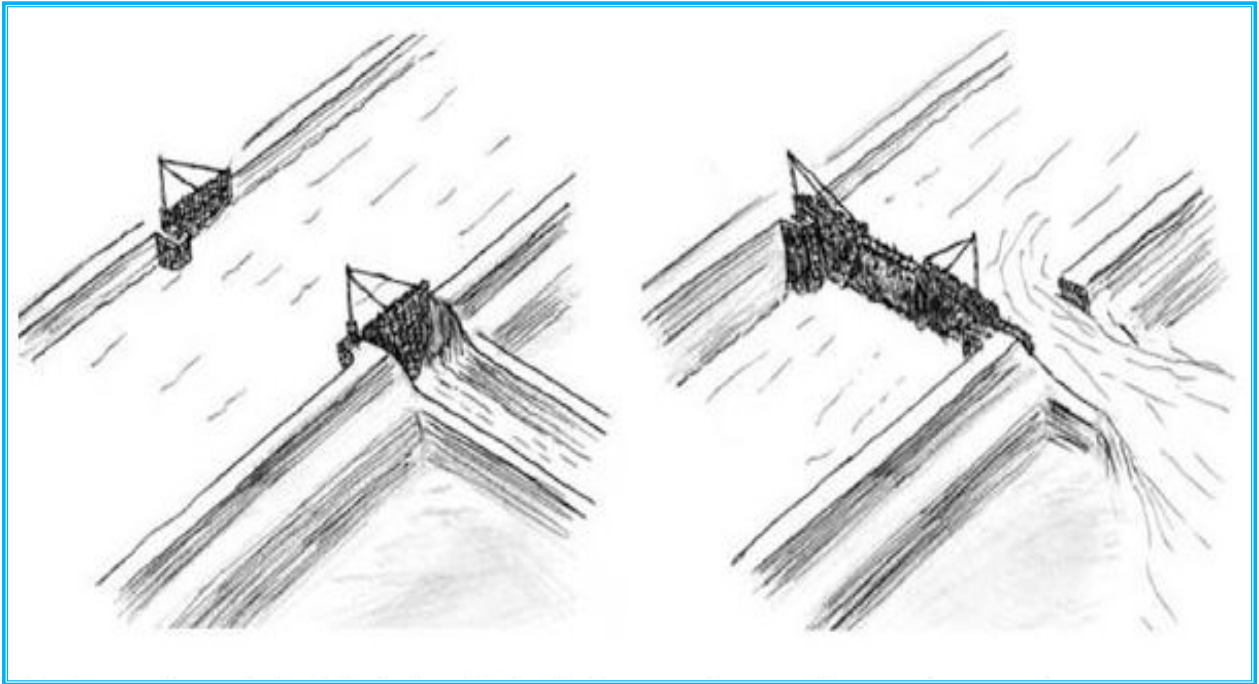


Figure 10: Damming of a large stream, Lambert (2007) ⁽⁶⁾.

Another arrangement of feeder canals intakes may have looked like Figure (11) where a sluice gate was placed at the head reach of feeder canals to regulate the flow entering the canal or shut it off completely. This arrangement was documented by Buccellati ⁽⁷⁾ from excavations in Terqa in Middle Euphrates in Syria, but it can very well represent similar situations in Lower Mesopotamia. Other arrangements were also used as indicated by many tablets left by the Sumerians. More elaborate works were constructed to fulfil multipurpose objectives; such as, slowing down the flow to avoid scouring of the canals, settling basins to reduce the silt load and provide clear water, in addition to acting as water storage for later uses; one example is given in Figure (11).

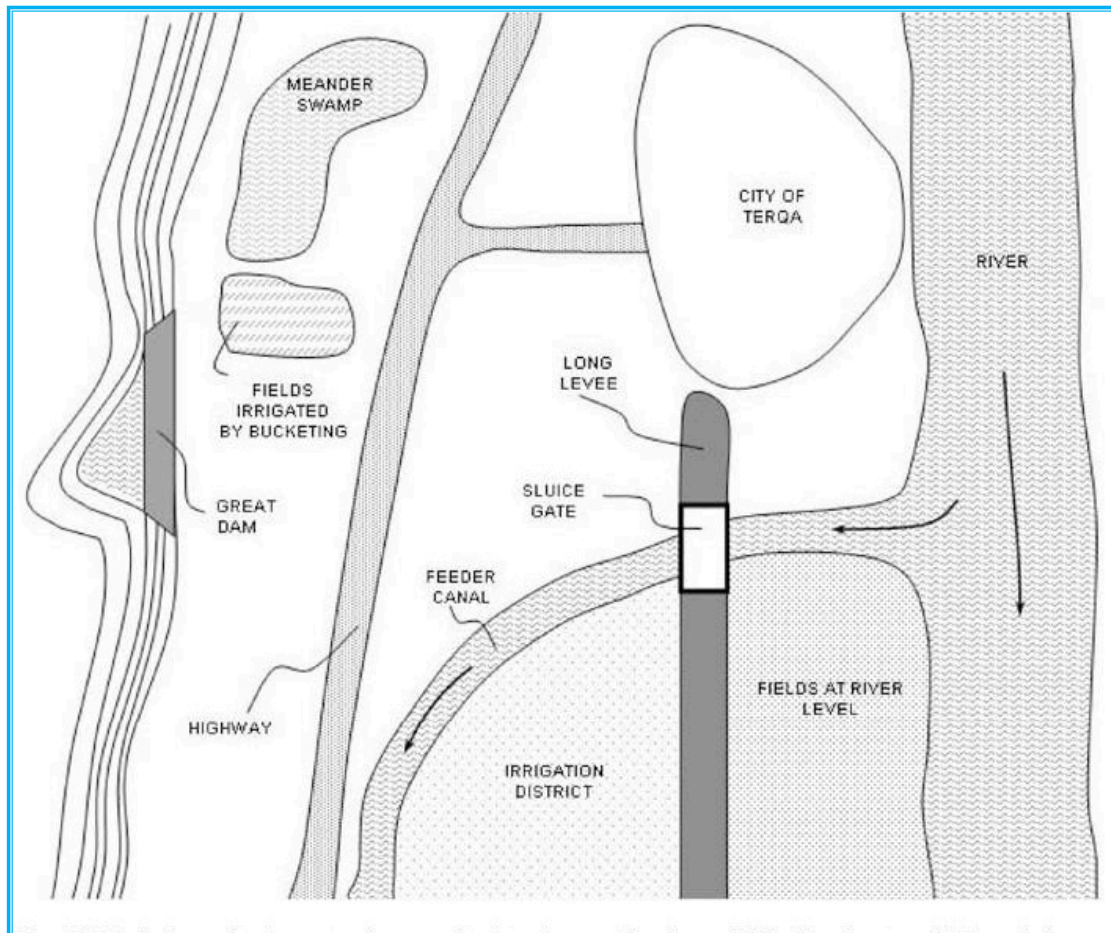


Figure 11: Schematic layout of an agricultural complex in middle Mesopotamia
From Buccellati (7)

The inscriptions recorded different designs with different dimensions for reservoirs, and examples were given of dimensions, which varied between 12 meters to 72 meters long and widths ranging between 6 meters to 12 meters, and heights between 3 meters to 5 meters. Figure (12) is conceived from *Ur III* text, which was reconstructed by Shin T. Kang and quoted by Tamburrino (4). The nomenclature shown on this figure gives the Sumerian names and their equivalent in English as translated by Kang.

The *Sumerians* did not fail to control the flow in their canals by constructing regulators similar in many respects to regulators of

modern times. Genouillac and Parrot uncovered one example of such structures during excavation from 1929 to 1932 in a site at *Tello*, the ancient town of *Girsu*.

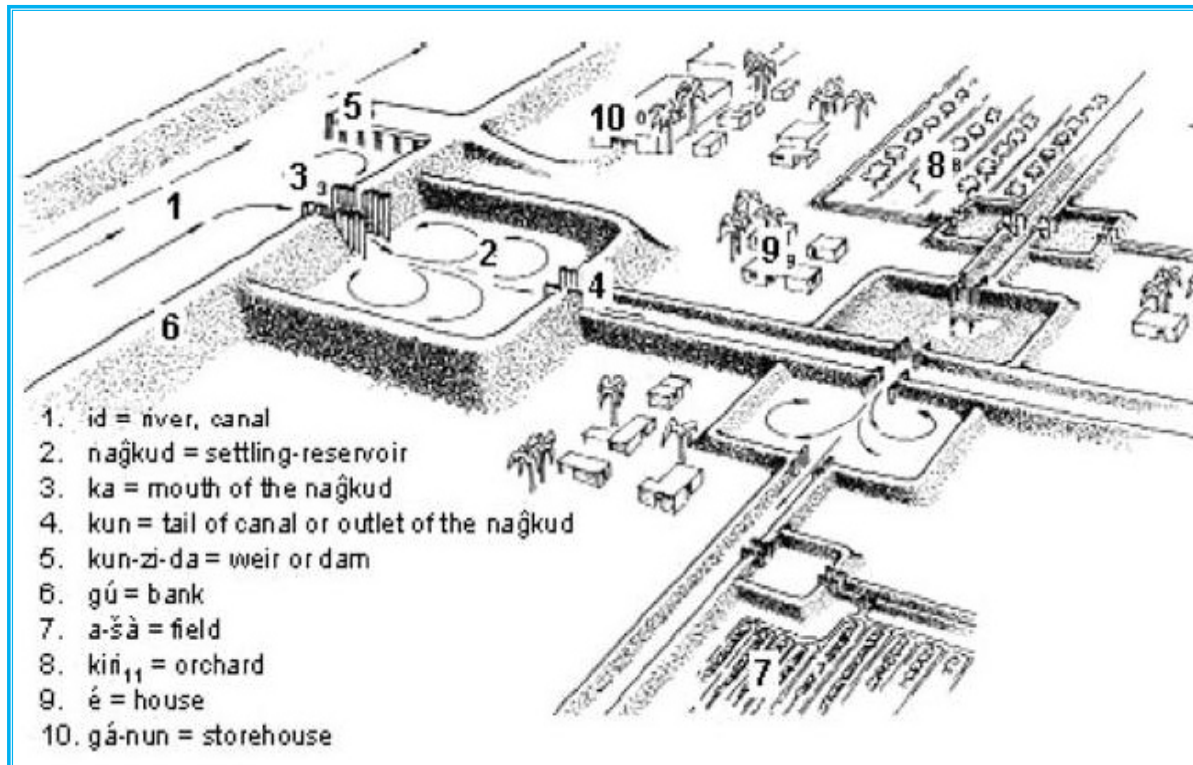


Figure 12: An example of a settling reservoir and complimentary waterworks

This regulator was placed at the eastern levee of an affluent of the Euphrates, which was called *Nina-gena* canal that flowed from North to South ⁽⁸⁾. The original plan and full description were given by Parrot ⁽⁹⁾, in addition to his visualization shown in Figure (13). The structure was made entirely of baked bricks bonded with bitumen. Sounding done in the site during excavation discovered a bitumen impregnated reed mat under the brickwork of the foundation. Bricks of various sizes were used in different parts of the structure, but this had no significance to its length or mode of action. The brickwork walls (A-B) and (C-D) were protecting the clayey silty banks from

erosion and were set at an angle forming the funnel shaped entrance and were supported by the external brickwork projections (a, b, c) and (d, e, f, g) which added extra support to these walls. The walls (B-E) and (C-F) which formed the rectangular section of the main structure were supported by the buttresses (h, l, j), and (k, i, m) respectively.

Moreover, the thick sluice floor was made of six courses of bricks laid on a bed of reeds and bitumen, and the sluice measured 11.4m x 3m. The downstream part was formed from the wing walls (E-G-H) and (F-I-J) which were supported by buttresses and formed a fan that directed the flow into the 16 m wide canal. From the excavation, the sidewalls were about 5 m high, but bricks may have been pillaged from the top of the structure, so it is possible that the structure could have been higher enabling it to cope with most flood conditions and provide water from April to June. Throughout the excavation works, it was revealed that the soil filling adjoining the structure was of compacted clay while loose materials that had concealed it during all those years buried the structure itself.

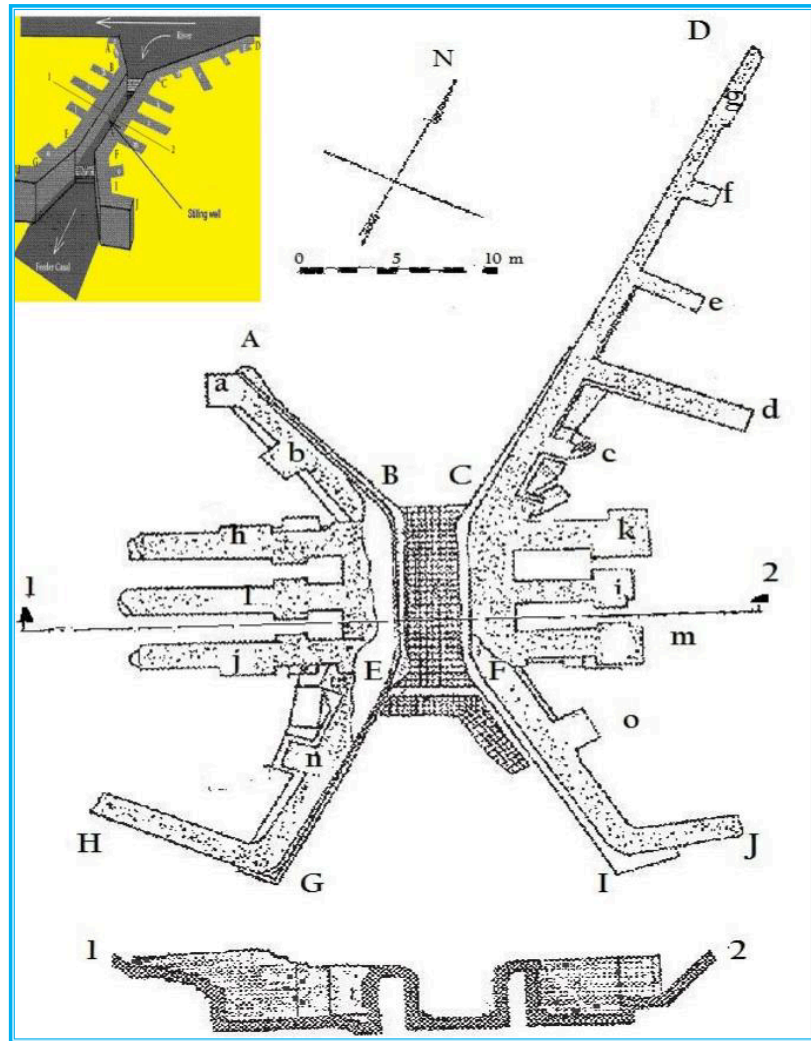


Figure 13: Head Regulator of Nina- gena canal, Plan and cross-section with a perspective view (Image modified from Parrot ⁽⁹⁾).

Control of the flow through the regulator was done by using horizontal wooden beams, which may have been similar to the stop logs we use today in such hydraulic structure. But, there were, however, no side grooves in the walls to install the beams and it is assumed that these beams were held in position using wooden supports. The number of beams could be increased or decreased following the fluctuations of water level in the river, and the discharge required in the canal. Evidence of the use of such beams

was revealed in the “Epic of Gilgamesh”, the great Sumerian version of the Great Flood ⁽¹⁰⁾. In one text, which belonged to Pre-Sargonic Lagash, description is found of one irrigation system on three tablets, which described the length of a canal that was under construction or repair, and the description of a regulator, which fed another canal.

From information given by Stienkeller ⁽¹¹⁾, the dimensions of this regulator were 18m x 3 m as visualized in the sketch of Figure (14). In addition, it had upstream wing walls 27 m and 24 m long to protect the structure which itself cut through the levee on the river bank and fed a canal 6m wide. Other details are similar to the regulator in Tello (Girsu) which indicated that such structures were very common, and that there was an accumulated wealth of experience in such works at the disposal of the planners and constructors of these networks (11).

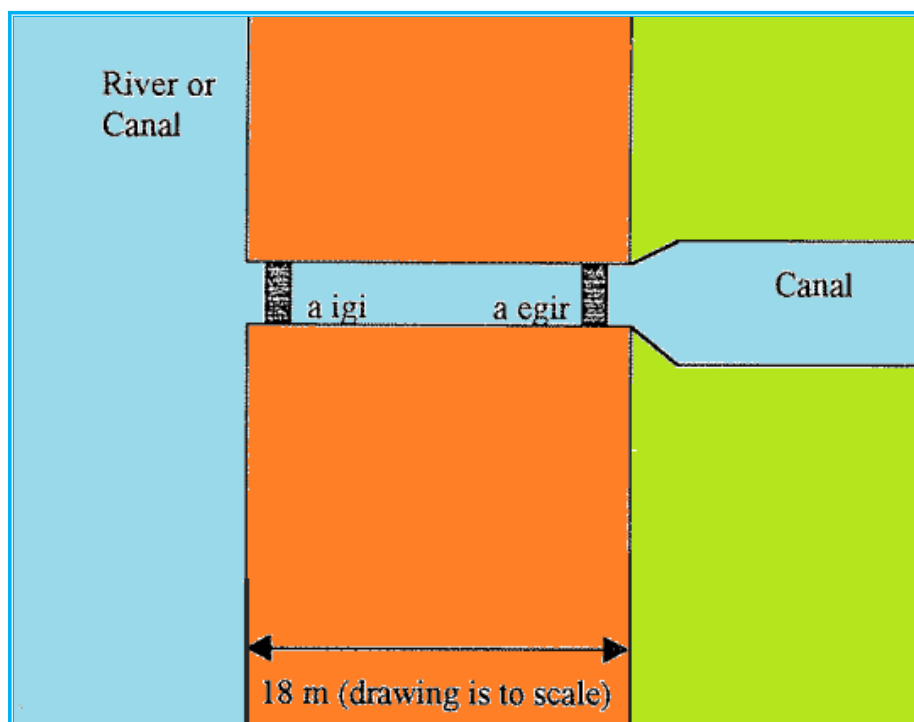


Figure 14: Plan of regulator described in Sumerian tablet ⁽¹¹⁾.

The Sumerian irrigation canal system was very extensive, and the number of excavated archaeological sites was so large that the remnants of many major canals could be pinpointed and traced as shown in the map in Figure (15) which was originally produced by Jacobson⁽¹²⁾. In this map, the old Euphrates river course is shown from which all the major canals were branching. Locations of major regulators are also shown on this map and indicated by red colour rectangles. The sites of some of the most important Sumerian cities are shown also, where it is clear that these cities were located close to these headwords in order to control the water flow to the territories along these canals. Modern cities of Iraq are also shown in addition to so many locations of excavation sites, which were dug during the period from the end of the 19th century to well into the 20th century.

It must be emphasized here that there are probably thousands of such sites waiting to be investigated. The area irrigated from two of these canals, namely *Girsu* canal and *Kimah* canal, were estimated by Dight.et.al ⁽¹³⁾, based on their dimensions of 16 m width and 6 m width respectively assuming a four-month irrigation period during winter and growing cereal crop with a water requirements of 600 l/m² per year and 40% of water losses due to evaporation and seepage in the distribution network. The conclusion was that the *Girsu* canal and *Kimah* canal irrigated 10,000 ha and 2,000 ha respectively. Considering that the cultivation system was based on the fallow system it follows then that the total areas served by the two canals can be doubled to 20,000 and 4000 ha.

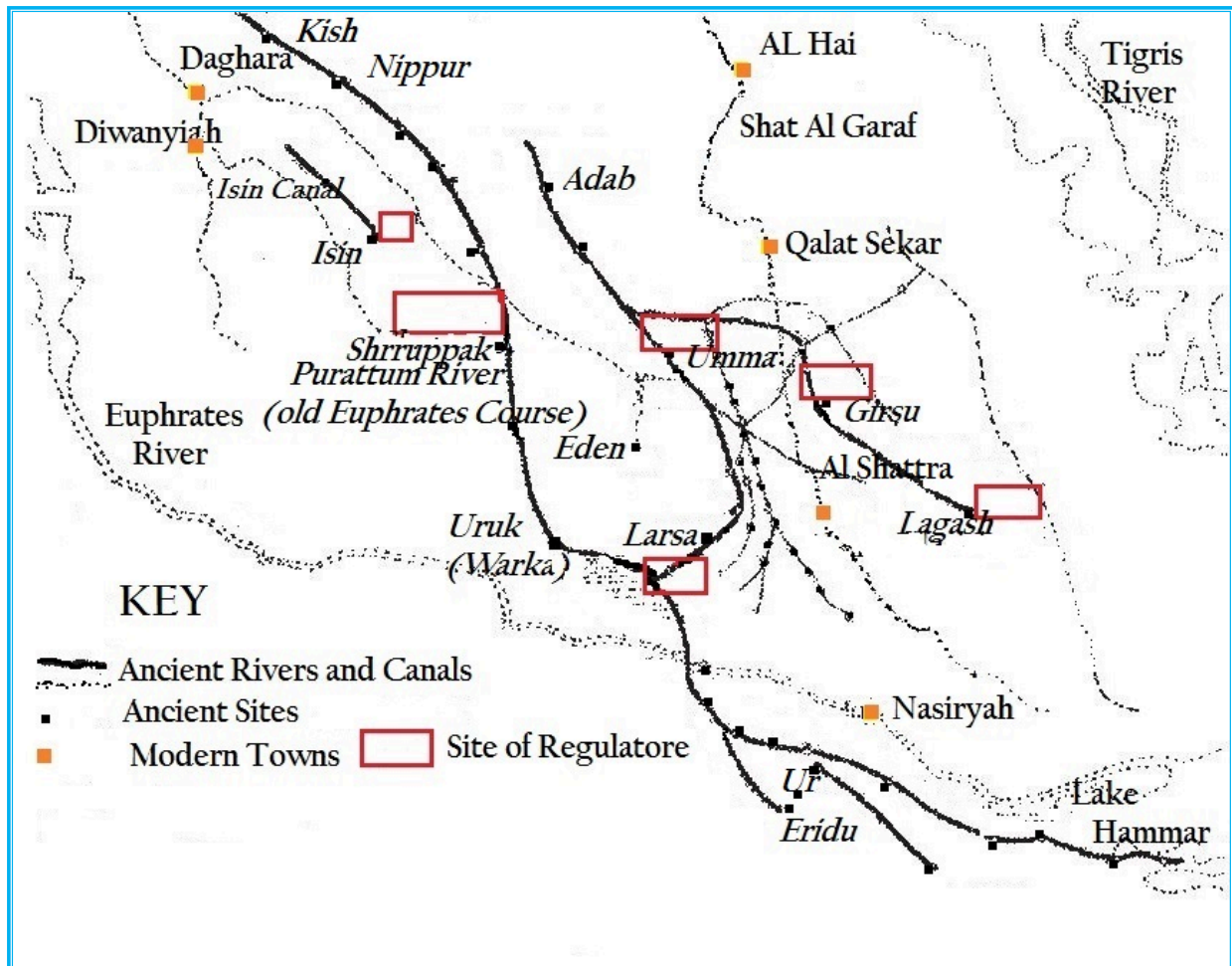


Figure 15: Map of the remains of major irrigation canals and regulators produced by Jacobson ⁽¹²⁾ (Modified)

The social system that supported agriculture and land cultivation in these city-states was mostly based on the feudal system. As one city-state fights and conquers another city-state then the land ownership of the conquered city-state is turned to the King and the Temple of the victorious city-state. There were also the other lands which are under the collective ownership of groups of farmers, in addition to many other holdings, which belonged to landlords from noble families who had acquired written documents verifying their ownership. Maintenance of the canals was a continuous task, and major canals were supervised by high officials who reported directly

to the King. Large gangs of workers were necessary to free the canals of silt, which demanded the removal of enormous amounts of mud. This was clearly documented on clay slabs of the types used at the time for writing and found during archaeological excavations reported by Tamburrino⁽⁴⁾.

The secondary irrigation canals, however, were solely owned and controlled by the farmers and owners of the served plots of land, and on their shoulders rested the duty of clearing them from sediments and maintain the continued discharge. In a similar parallel in modern Iraq up to the middle of the 20th century, large groups of peasantry called “*Hushoor*” used to get together to remove the silt depositions from irrigation canals and keep the free flow going in them. The Schematic diagram in Figure (16) sheds light on the hierarchy in the Sumerian society in which obviously the last rank in this hierarchy, consisting of slaves and criminals, were an important source of free labour in all the heavy tasks of farming and canals’ maintenance works. Most slaves were prisoners of war, but a free man could become a slave in case of failing the payment of a debt or committing a grave offence.

The distribution of water between users followed a fixed system agreed upon and followed by all those users, but this did not prevent conflicts and skirmishes over water rights. In the exploitation of their lands often, landlords of the larger holdings used hired hands to cultivate their land and paid their wages after harvest either in barley, sheep wool, and live animals or even in silver. Some of the poorer

owners were forced to mortgage their land to buy seeds, tools and other cultivation requirements and pay back after the harvest, in which cases they were protected from the exploitation of greedy money lenders by the law. If the harvest failed, however, for reasons beyond the control of the farmers, the law also exempted them from the payment of the interests.

King and Priests
Land Owners, Government Officials, and Wealthy Merchants
Farmers and Artesian
Slaves and Criminals

Figure 16: Class hierarchy in the Sumerian Society

Conflicts over water rights and agricultural lands between city-states were also common. These conflicts were settled either by, arbitration or even by one of the two states digging a new canal and build new control and distribution structures to avoid sharing, or if all means of settling the matter fail, then this will end in the eruption of full-scale war between these states. Such wars may end by conquering of one of the two city-states and taking over its lands or, by signing a new reconciliation treaty with new conditions and payments of large penalties. In this respect, many examples are given in the Sumerian history. One such example is found in the long feud between the city-

state (Lagash) and the other Sumerian city-state (Umma). The conflict focused over the irrigation of the lands around the present-day town called (Al-Shatra) very close to the southern part of the present-day river (Shatt- Al-Garaf). Lagash was located on the left side of this river, 20 kilometres northwest of Al-Shatra, while Umma was situated near the present day mound called (Tel Khoja) on the right side of Shatt-Al-Garaf river at a time when this artificial river did not exist.

The lands of Lagash were irrigated from the watercourse branching from the old course of the Euphrates River and passed through Umma's territory, which had also water rights to the same water course. There were many instances when Umma had taken more than its share of water, and other times when it diverted the flow on purpose to damage the Lagash cultivations; in addition to the ambitions perpetuated by Umma to take over one of the larger and more fertile estates of Lagash called (Guedinna) and annex it to its own lands. This estate, however, had been the subject of a claim by Umma especially that it was irrigated from the same canal supplying both Lagash and Umma. This led to a series of skirmishes and bitter disputes between the two city-states.

An old inscription, however, states that the dispute was solved at least temporarily by arbitration. Both parties had accepted that Mesilim, the King of Kish, who seemed to have patronage over both of the conflicting cities, should act as an arbitrator. Mesilim in his turn proceeded to arbitrate the controversy by measuring the boundary line between the two city-states and reached his decision, which was

in favour of Lagash. He then installed land marks of stone to mark the border and settle the case. Later on, the new king of Umma called Ur-Nanshi who removed those landmarks, crossed the border, and then seized the land again violated this decision. Fighting erupted many times until this was settled in a fierce battle between the armies of the two states in which victory was the share of (Eanna- Atum), King of Lagash and the killing of (Ayna-Kala) King of Umma and son of Ur-Nanshi at about 2470 BC ⁽¹⁴⁾. The victorious king took further steps to remove all reasons for such fights with Umma and he accomplished this by digging a new large canal off taking this time from the Tigris River and not from the Euphrates.

This new and very large canal he called (Lumna- gimdug) which is the present day (Shatt- Al Garaf), mentioned previously, and which extended for 130 kilometres to reach Lagesh territory. This work remained an example of very highly sophisticated engineering achievements for a very long time, in which technical methods and surveying works were utilized. It was lined with baked clay bricks and plastered with bitumen, and bunds were constructed along its banks.

In the passage of time, however, the dimensions and depth of this large canal increased steadily due to its steep slope, and it became the main branch of the Tigris River; the Shatt- Al- Garaf itself⁽¹⁵⁾. From Sumerian inscriptions, it is known also that Eanna- Atum accomplished more of such engineering achievements. Among these, he had built a small reservoir and a new canal connected to it and

called (Khoma- Dimsha), and a submerged weir on a canal called (Jarso) at about 2430 BC to raise the water level and have a higher command of the land. Other inscription also indicates that the successor king (Enti-Mena) had also constructed such a weir at about 2400 BC. The quantity of bitumen used in both weirs was about 270, 000 litres and the number of burnt bricks were more than eight million bricks.

This first *Sumerian* dynasty continued from 2900 BC. It ended in 2350 BC at the hand of *Sargon I*, who had started as a high ranking official at the court of (*Ur- Zababa*) the last king of this dynasty and had probably killed him and replaced him to mark the start of the Semitic *Akkadian* domination which lasted almost 200 years to 2150 BC.

Sargon was a powerful man and a military genius and administrator who probably consciously or not began to change the Sumerian culture to the Semitic one but failed to stamp out the Sumerian culture, which continued even after the fall of “*Agade*” his capital some 200 years later. One thing, which may be said on *Sargon*’s credit, is his unification of all Sumerian city-states under his rule and extending his empire, so it was said that his influence was felt from Egypt in the west to India in the east.

During this period of Akkadian control, the *Sumerian- Akkadian* culture was dominant in every day’s life and practices and irrigation, and agriculture continued to flourish until the *Akkadian* empire collapsed in the destruction of its capital “*Agade*” at the hand of the

barbaric and nomadic people, the *Gutians*. These tribes had descended from the mountainous region of Elam in the east and ruled for a very short period, but this did not prevent the rise of a second *Sumerian* dynasty (*Ur III*) which continued to rule from 2150 BC until 2003BC, and so the *Sumerian- Akkadian* culture was kept alive during all this long period.

The *Sumerians and Akkadians* of ancient Iraq were indeed “The Peoples” who had laid the foundation of civilization as we know of today. To describe this civilization, it was an agrarian civilization based on irrigated agriculture; so it may be worthwhile here to describe some of the methods, equipment and far-reaching technologies and achievements developed by the *Sumerians and Akkadians* in the fields of irrigation and agriculture. Each of these innovations represented at that time a real breakthrough, which was used in so many countries of the world for thousands of years, afterwards without much change or improvement and even being used nowadays in some communities. These achievements can be clearly seen in the construction of an intricate system of canals, weirs, dykes, and reservoirs, which demanded considerable engineering skills and knowledge. Surveys and plans had to be prepared, which involved the use of levelling instruments and rods, in addition to drawings and mapping. The need for calculating areas and volumes enhanced trigonometric and geometric methods.

The growing of crops and farming operations had to follow strict time schedules and instructions which the farmer had to adhere to in

order to fulfil the tasks in the best possible way and get the full reward for his work. Sumerians therefore, had to follow the change of seasons and the sun movement, which gave fruit in the developing astronomy. An account of some of the farming operations, rules and instruction was inscribed on a clay tablet uncovered during excavations in the city-state *Ur*, and described by Kramer ⁽¹⁴⁾ ⁽¹⁵⁾.

On this tablet, there were inscriptions of such detailed instructions that give clear insight into all farming operations followed at that time. At the start, the dry soil is wetted by flooding the farm with water; as water recedes then lose shod oxen are let loose to crumble the wet ground, thus stamping out the weeds and levelling the surface which must be dressed with small light axes until it is even. Since the hoofs of oxen have left their mark on the still wet ground, men with pickaxes must go around the field to smooth it out.

While the field is drying, the farmer is advised to prepare his tools, equipment, beasts and seeds that are necessary for the next stage which involves such operations as harrowing and raking the ground to break the clods and removing the weeds. The actual ploughing and seeding can now take place by ploughing the field twice using two different deep soil ploughs. Seeding will be done simultaneously with the second ploughing operation by means of a seeder; that is an attachment to the plough which carries the seeds from a container through a narrow funnel down to the furrow as shown in Figure (17).

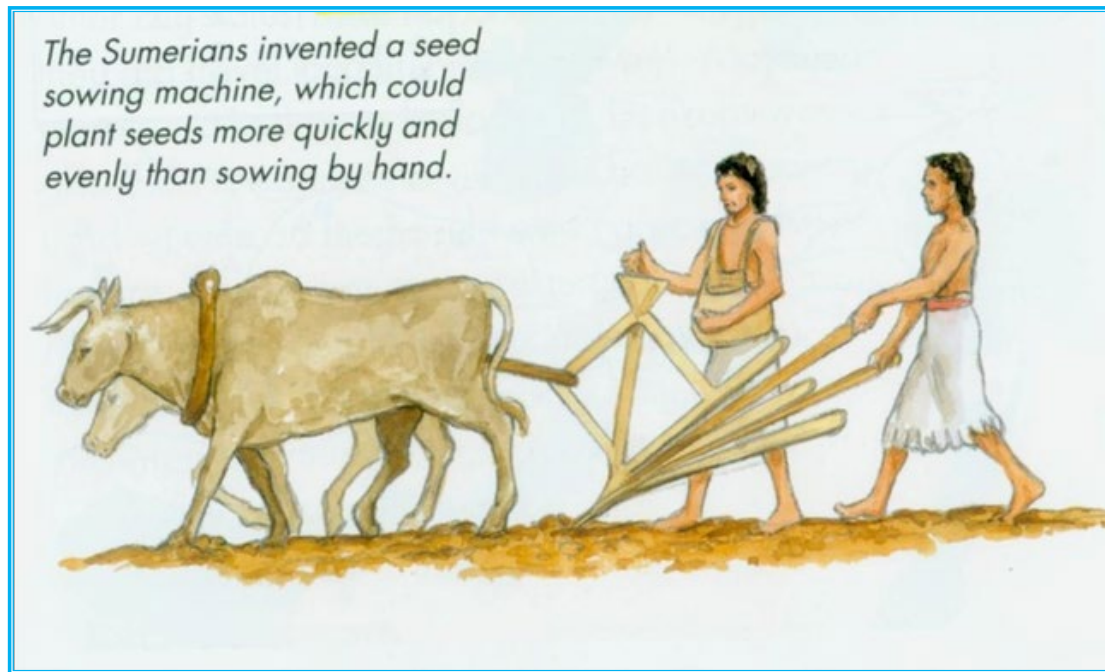


Figure 17: A plough and seeders of the type used by Sumerians.

The farmer was advised to plough eight furrows in each strip, which was about six to seven meters wide. Following all this the field had to be cleared of clods and ground elevations and depressions and levelled off so that sprouting of barley would not be restricted in any way. When the plants had grown sufficiently to fill the narrow furrows, it was time to water it; and when it stood a little higher than the furrow's top, it was time to water a second time. The third irrigation would then take place when it reached its full height. If the barley or wheat was doing well then fourth, irrigation could be done to obtain an extra yield of about ten per cent. As the time of harvest arrived, the farmer was informed not to wait until the barley bends under its own weight but to harvest it while it is still erect. Teams each of three men were to reap, bind and to arrange the yield in the sheaves.

The thrashing, which followed harvesting, was done in two stages. First, the mounds of crop were trampled down by wagons drawn back and forth over them for five consecutive days. Then thrashing sled, consisting of beams with iron teeth fastened with leather strips and held secure by bitumen, was used to “open the barley”. Next step in this sequence of work was winnowing, which was done by two men who used large wooden forks or shovels to lift the mixture of barley or wheat and chaff it in the air thus freeing the grains from the straw and husk.

The *Sumerians* and *Akkadians* in developing these procedures had to invent and manufacture all the equipment and tools required to fulfil the intended tasks and to use available recourses such as wood, bitumen, leather and iron which they had already mastered its production. Figure (18) illustrates many of the tools and equipment they used in this work.

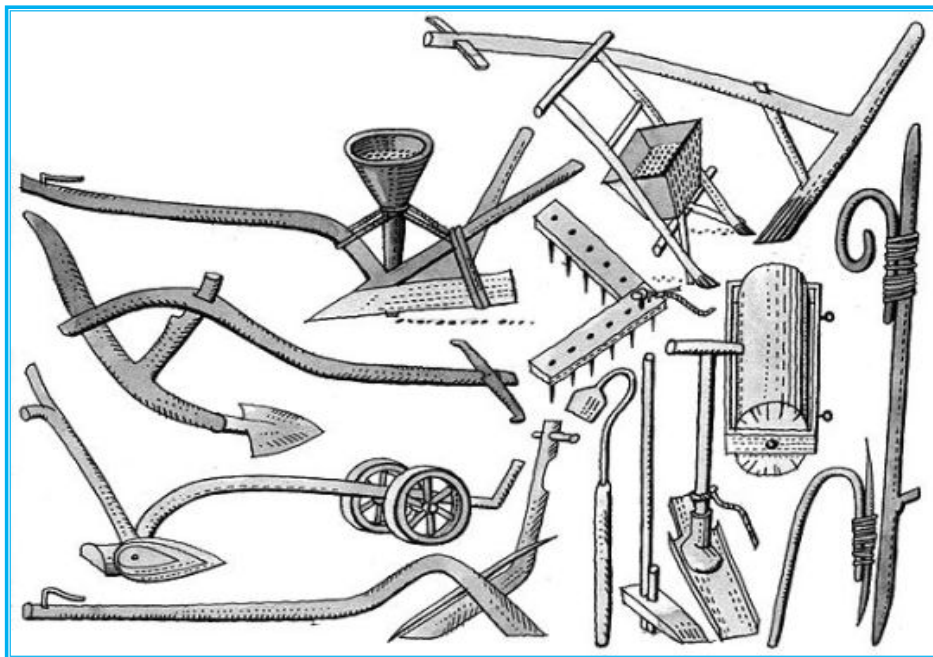


Figure 18: Tools and equipment used in Sumeria

On the irrigation side, *Sumerians* used gravity irrigation helped by the extensive network of canals and the many weirs they had built on rivers and large canals to get the required command. On the field level, they practised such methods like basin flooding, check flooding, border strip irrigation and furrow irrigation. These methods are still used in a great many countries of the Middle East and the world now. When water levels are low in the main feeders, they devised ingenious ways to practice lift irrigations. Among such devices was the “*Dalia*” which is still in use in Basrah in Iraq. Other devices were used such as the “*Charid*” or “*Kared*”, water wheels driven by oxen or mules, in addition to the huge water wheels driven by river’s flow. Many examples of such water wheels can still be seen on the upper Euphrates in Iraq and Syria. Full description of these devices is given by Sousa ⁽¹⁶⁾.

Many of the mentioned implements have proven their efficiency and usefulness till very recent times and some are still in use, even today in many places in Iraq. In fact, the southern district of Baghdad called “*Karrada*” has taken its name from the “*Kareds*” used to irrigate its extensive palm trees and mandarin orchards until the early days in the 20th century.

The Sumerians had excelled in hydraulics; apart from designing and constructing irrigation system they had to device ways and means for flood control as they were constantly threatened by the floods of the two rivers, so they had to learn ways to protect themselves and their lands from such floods, which came periodically every spring. In

this way, they constructed levees along the banks of the Tigris and Euphrates and kept them maintained ⁽¹⁷⁾. They even devised methods of protecting the levees side slopes in contact with water from the erosive power of the strong flood currents. This was done by laying mats of woven date palm fronds on these slopes and pins them down by long slender wooden poles. These mats and poles were still in use in Iraq until only few years ago, whereby the mats were called “*Bawari*” for the plural and “*Baria*” for the singular, and the wooden rods were tagged as “*Hawalesh*” for the plural or “*Halosh*” for the singular. The most recent use of these *Hawalesh*” and “*Bawari*” in Iraq was during the Euphrates floods in the sixties of the last century, and in the floods of the Diyala River in 1973 and 1974, which had threatened the capital Baghdad.

If any breach developed in these levees during one of these floods, the Sumerians could use ways to close the breach quickly before it enlarged to threaten the collapse of the whole levee. This was done by use of “*Batkha*” which again remained in use until a few years ago in the lower Euphrates area. The “*Batkha*” itself consisted of a long role of brushwood and reeds bound together by ropes made out of the fronds of date palms. A completed “*Batkha*” would be laid in the stream against the breach and loaded with layers of palm tree fronds, dry branches of trees, dry thorn, thistle and earth to sink it to the bottom and to be followed by the next one which should be ready by now. The process would continue until the breach was closed. Sussa (15) again describes the process in full.

The Sumerian ecosystem may be described as being very fragile. The nature of alluvial delta, its geography, topography and its bordering marshes and lagoons imposed strict organization and operation procedures to keep the fertility of the land to produce enough yield. The shallow depth of groundwater and the danger of salinization required that the fallow system of cultivation be adopted, whereby a plot of land could not be cultivated in two consecutive years but left one year to rest to keep the groundwater level below the root zone. The second matter, which had its bearing, was the arid climate with precipitation below 250 mm/ year, which forced artificial irrigation on the communities of the lower Mesopotamian region. The intensive canalization dictated communal work to keep irrigation canals free from sediments and to maintain constant full discharge.

This communal work also reflected on the organization and administration aspects of the irrigation and agriculture procedures. The land or farms were mostly divided into plots of elongated and rectangular strips to allow the irrigation of each of them from a single outlet. The area of each farm had to be limited to a manageable size between 90 and 135 Sumerian *iku* which would approximately equal 32 to 49 hectares. Texts retrieved from *Ur III* revealed that in provincial land, “cultivators” were organized in groups of fives under the direction of an “inspector”, who in turn answered to an “overseer” (*Uggula*), and one “cultivator” was usually to be in charge of one field or a parcel of fields. Some of the agricultural workers on the provincial fields had even full rights to plots of the land and such

holders would receive fixed annual grain ration based on the plot size according to the predetermined production rate irrespective of the inevitable regional and annual yield fluctuations⁽¹⁸⁾.

Historians agree that the *Sumerians* were successful in establishing the first great civilization in the history of mankind, where it had all the characteristics for any civilization to be worthy of the name. In its fabric, all the elements for such civilizations were present; including socio-politico-economic features, centralization, the domestication of animals, specialization of labour, monumental architecture and taxation. It was organized in densely populated settlements divided into hierarchical social classes with ruling elite and subordinate urban and rural populations; which engage in intensive agriculture, mining, small-scale manufacturing and trade. The *Sumerian* civilization was agrarian as one would expect to have in such a long past.

Like all great civilizations of past history, this civilization in its rise had also the seeds of decline interwoven in its fabrics, which only could have an effect after it had passed its maturity. Being an agrarian civilization, it had the two basic elements of land and water resources, which contributed to both its rise and decline. *Sumerian* heartland was a deltaic region built by the sediments of the Tigris and Euphrates Rivers over a very long period, so it had the nutrients brought by the floods of these two rivers. At the same time, it was low land by nature of its geological origin surrounded by water from three sides; namely the Tigris from the east, the Euphrates from the west and the marshes

and lagoons and the Gulf from the south. It was natural that the water table was very high, and in order to have successful agriculture, the *Sumerians* had to resort to fallow cultivation to avoid the rise of the water table into the root zone and cause waterlogging.

One great danger facing the *Sumerians*; was the *salinization* of the land. The semiarid climate of southern Mesopotamia and the general low permeability of the soils exposed it to the dangerous accumulation of salts, which are harmful to crops and could cause the abandonment of the land. The source of these salts was the irrigation water from the two rivers that had been dissolved from the sedimentary rocks forming their catchments in Southeastern Anatolia.

Even though the concentrations were, low the accumulation of these salts in the soils over hundreds of years resulted in generally inferior soils that had to be managed with care. Citations of salinity problems from ancient records indicate that a serious problem of salinization of the land appeared from 2400 BC on ward after a time when agriculture had just flourished to a very high level. Apparently, this problem had its roots in over irrigation of the land. The long and bitter conflict between the two city-states Girsu (*Lagash*) over one of the largest canals taking off from the Euphrates had lasted for many generations. The matter was not settled until the King of *Lagash* had dug a very large canal, which was already described, to transfer large quantities of water from the Tigris.

Finally, this had contributed to the rise of the groundwater table to unmanageable levels. To this fact Jacobsen et al ⁽¹²⁾ attest that the

abundant source of water had simply resulted in over-irrigation and led to the salinization of the soil. The presence of patches of saline ground was mentioned in records of ancient temples' surveyors. In a few cases, individual fields, which at that time were recorded as salt-free, were shown in an archive from 2100 BC to have developed conditions of sporadic salinity during the 300 intervening years of cultivation. The choice of the crop that was grown in the region showed another indication of these deteriorating land conditions.

Counts of grain impressions in excavated pottery from sites of about 3500 BC suggested that at that time the proportions of wheat and barley were nearly equal. A little more than 1000 years later at *Girsu*, the less salt tolerant wheat accounted for only one-sixth of the crop. By about 2100 BC wheat had slipped still further down, and it accounted for less than two per cent of the crop in *Girsu* area. By 1700 BC the cultivation of wheat was abandoned completely in the southern part of Mesopotamia. The shift to barley cultivation was due to serious decline in fertility, which for the most part, can be attributed to salinization.

At about, 2400 BC in *Girsu* number of field records gave an average yield of 2537 litres per hectare. This is a very good figure even in advanced countries today. This figure had declined to 1460 litres per hectare by 2100 BC, and by about 1700 BC, the yield recorded by *Larsa* had shrunk to an average of only 897 litre per hectare. This general decline in the yields had its adverse impacts on the wealth and livelihood of the region, which was not abandoned

completely but had caused the cultural and political leadership to pass permanently out of it with the rise of *Babylon* in the 18th century BC. This is how the story of this great civilization ended. Other civilizations, which followed, will remain indebted, however, to the *Sumerians* for all what they have contributed.

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In Old Babylonia, Irrigation and Irrigation flourished Under the Code of Hammurabi (2000- 1600 BC)

Two centuries already had passed since the fall of the last Sumerian dynasty of *Ur* in 2003BC until the first kingdom of *Babylon* did appear. The collapse of *Ur* itself was brought about at the hands of the *Amorites*, which triggered major and important turning point in the history of Mesopotamia. On this account, a brief presentation of the *Amorites* looks very much justified. The *Amorites* were Semitic people who had lived in the west of middle Mesopotamia, which included the land of *Canaan*. They appeared as uncivilized and nomadic clans ruled by fierce tribal chiefs, who forced themselves into lands where they needed to graze their herds. From the early Mesopotamian writings of *Sumer*, *Akkad*, and *Assyria*, it was clear that the *Amorites* were especially connected with the mountainous region now called *Jebel Bishri* in northern Syria which is named the "*Mountain of the Amorites*". From the 21st century BC, and possibly triggered by a long major drought starting about 2200 BC, a large-scale migration of *Amorite* tribes infiltrated southern Mesopotamia. Some of the *Akkadian* literature of this era spoke disparagingly of the *Amorites* which were called (*MAR. TU*), and implied that they were nomadic and primitive, and even looked to their way of life with disgust and contempt:

“The MAR.TU who knows no grain.... The MAR.TU that knows no house nor a town, the boors of the mountains.... The MAR.TU that digs up truffles... who does not bend his knees (to cultivate the land), who eat raw meat, who has no house during his lifetime, who is not buried after death”

And add:

"They have prepared wheat and gú-nunuz (grain) as a confection, but an Amorite will eat it without even recognizing what it contains”.

By the time of the last days of the third dynasty of *Ur*, the immigrating *Amorites* had become such a force that obliged the *Sumerians* to construct a 270-kilometre (170 mi) wall from the Tigris to the Euphrates to hold them off. However, this proved to be a futile effort, and they became one of the instruments of the downfall of the third dynasty of *Ur*. Many Amorite chieftains in southern Mesopotamia aggressively took advantage of the failing kingdom to seize power. There was not an *Amorite* invasion of southern Mesopotamia as such, but the *Amorites* ascended to power in many places, especially during the reign of the last kings of the *Ur III* dynasty. The following *Amorite* dynasties took over the rule of long-extant city-states such as *Isin*, *Larsa*, *Eshnunna*, and *Kish* and established new ones.

After a brief period of an *Elamites* and old *Assyrian* empire domination that took place within (2050- 2004BC) the *Amorite* kingdom was firmly established (2004 – 1595 BC) which is sometimes known as the "*Amorite Period*" in Mesopotamian

history⁽¹⁾. The small town of *Babylon*, unimportant both politically and militarily, was raised to the status of a minor independent city-state, under *Sumu-abum* in 1894 BC and this led the way to the rise of the powerful King *Hammurabi* (1810 BC – 1750 BC) who united all the city- states and established the *Babylonian Empire*, Figure (19).

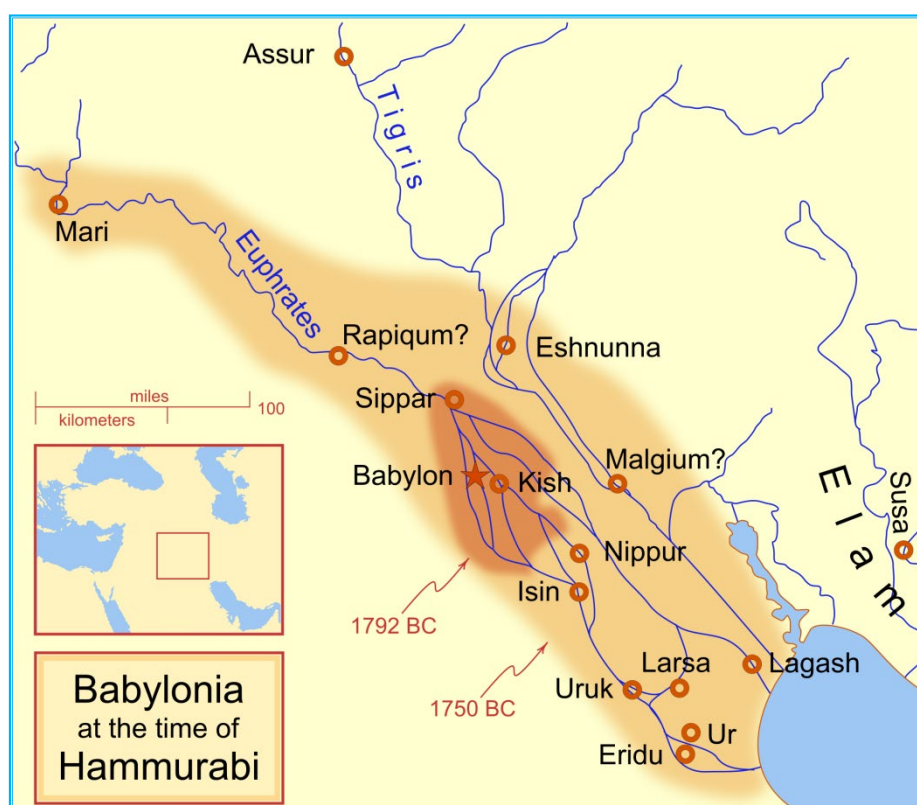


Figure 19: Babylonia at the time of Hammurabi

The heartland of *Babylonia* was downstream of the present day Baghdad or better, from the point where the two rivers, Euphrates and Tigris, approach each other so closely that they leave a stretch of only about twenty miles between them. It was not situated in the alluvium plain between the two rivers, but rather on the banks along several courses of the Euphrates that fanned out in a number of channels during the history of the river. At times, *Babylonia* reached beyond

the Tigris, into the flat lands and foothills of the Zagros range; generally along the eastern tributaries of the Tigris. Its political and cultural influence extended upstream, along both rivers, on the Euphrates as far as *Mari* and beyond, on the Tigris as far as Assur. The two rivers in *Babylonia*'s high time, as they were in the *Sumerian* era were also the two arteries which had supported the flourishing agriculture then and there, and it was along their two courses and by the natural or the dug canals, all the city states of the *Sumerians* and the *Babylonian* cities were established. However, the two rivers emptied directly into the Persian Gulf, not as the case now, as they both join to form Shatt Al- Arab which did not exist at that time.

Babylon became the major power in the ancient world during the reign of *Hammurabi* , and it was from then that southern Mesopotamia came to be known as *Babylonia*. The rise of the *Amorite* kingdoms in Mesopotamia brought about deep and lasting repercussions in its political, social and economic structure, especially in southern Mesopotamia. The religious, ethical, technological, scientific and artistic directions in which Mesopotamia had been developing since the 4th millennium BC were not greatly affected by the *Amorites'* hegemony. They continued to worship the *Sumero-Akkadian* gods, and the older *Sumerian* myths and epic tales were piously copied, translated, or adapted, generally with only minor alterations. In *Babylonia*, agriculture thrived and the *Sumerian* ways and means were developed further. The reign of *Hammurabi* witnessed the great care he devoted to maintain and expand irrigation

networks, who even developed articles in his famous code to protect them.

The new empire which had its capitol established in *Babylon* had already received from the *Sumerians* very advanced agricultural base in the form of huge irrigation canal networks, dams and agricultural knowledge, so they did not have to add much on that. But due to the changing and shifting of the Euphrates and Tigris Rivers, they had to dig new feeder canals and build new dams each time these two rivers changed their courses; which happened often due to their violent and frequent floods. One historical example of such a flood is the one which had occurred between 1865 BC and 1850 BC whereby; the Euphrates changed its course in easterly direction and followed the course of the then “*Babel River*” branch, believed to be the present days “*Shatt- Al Hillah*” branch. This change resulted in cutting off all the canals off- taking from the old course, and required digging of new canals ⁽²⁾. This behavior of the Euphrates is characteristic of fluvial rivers, and it is a well-known fact that it had changed its course many times in history. The last of such events was at the end of the nineteen century due to silting up of “*Shatt Al Hillah*” branch head reach and concentrating the flow in the second branch “*Al Hindiya*”. This was the reason behind the construction of Al Hindiya Barrage in (1911) to divide the flow equitably between the two branches.

King *Hammurabi* was not only a worrier that united the whole Mesopotamia under his rule, but he was also a keen builder as he undertook a series of public works, including heightening the city

walls for defensive purposes and enlarging it, and expanding the temples. It is known that he had built a great bridge across the Euphrates connecting both banks of Babylon city itself ⁽³⁾. Babylon flourished during his reign, and it extended over a large area on both banks of the Euphrates as seen from the map in Figure (20) ⁽⁴⁾.

Hammurabi was convinced, and so his people were, that the good ruler was the one who would provide agricultural wealth for his people. In southern Mesopotamia where very little rain fell, this meant digging and maintaining irrigation canals to water the field. Boasting of such work one would not be surprised to see such an inscription left by *Hammourabi* commemorating his works which says:

“I dug the canal Hammurabi-is-the-abundance-of-the-people which brings a profusion of water to the land of Sumer and Akkad”.

As fields in lower Mesopotamia could only be cultivated when irrigated, the digging of a canal was an obvious blessing for all. Again, references to such acts by rulers of this time are numerous, and *Hammurabi* did not fail in this respect. Therefore, when late in his life he boasted of his accomplishments in the prologue of his code; he wrote speaking of himself as:

“The one who extended the cultivated lands of the city of Dilbat and who filled the granaries for the powerful god Urash.”



Figure 20: Map of Babylon at the Hellenistic age but basically developed in Hammurabi reign showing the bridge on the Euphrates, the nine gates in the city walls, and the Temples ⁽⁴⁾

“Hammurabi” completed many irrigation canals. One of these were the great canal which he dug and called “*Nar Hammurabi*” or the *Hammurabi-is-the-abundance-of-the-people*”, to carry water from the new course of the Euphrates, after the river had changed its course, down to the city of “*Kish*” in the direction of “*Umma*” and then to the city of “*Larsa*” to empty afterwards in the Gulf.

Hammurabi, as usual, boasts of his work on canals and many of his preserved inscriptions recorded this. During the many wars between the states of the south in the early decades of his reign and even before that, some city- states regularly denied water to their neighbors by diverting it through new channels they had dug, which

bypassed their enemies' cities causing distress and barren lands. When *Hammurabi* established control over the whole region by 1760 BC, he restored the damage and brought water back to areas of the south that were previously deprived of it. His unification of the entire south of Mesopotamia and the lands north of Babylon, a territory stretching some 400 kilometers from north to south along the Tigris and Euphrates rivers, allowed him to dig long canals to the various cities of this domain. The “*Hammurabi-is-the-abundance-of-the-people*” canal, for example, ran by *Nippur*, *Isin*, *Uruk*, *Larsa*, *Ur*, and *Eridu*, and covered a stretch of land extending for a distance of some 160 kilometers. Pacification brought thus economic development, and increased the wealth of the population ⁽⁵⁾.

Hammourabi also directed his attention to the maintenance of canals freeing them from silt and maintaining their discharge, so we see him directing his official representatives in the cities under his rule just to do this. In a letter to *Sin- Adenam* governor of *Larsa*, he ordered him to gather all land tenants and users of the “*Damanom*” canal to dredge it of the accumulated silt, and instructing that this should be completed at the end of the month. In another letter he ordered the same official to complete the dredging of the canal to *Uruk* within three days as the work was in delay ⁽⁴⁾.

Hammurabi was also famous for his “Legal Code” or the “*Hammurabi Code*”, which we came to know about from an obelisk uncovered in an archeological site in Sousa in Iran in (1909 AD) and is kept now in the Louvre Museum in Paris. Figure (21) shows

Hammurabi himself in front of the *God Marduk* presenting him with the tablets of the laws inferring the divine power behind them.

The code, although had predecessors from Sumerian times such as *Ornimo*, *Labith Ishtar*, *Eshnunna* codes, it was more comprehensive and contained specific punishments and penalties for specific crimes and violations. The code contained 282 articles, and many of these articles were concerned with agriculture and irrigation, which showed the importance of them to the prosperity of Babylon, in addition to Hammurabi's keen interest in realizing justice. Articles covering agriculture dealt with, among other things, either leasing and cultivating the land, or taking loans for investing in agriculture, and their repayment. These can be seen from articles 42 to article 48, which had prescribed penalties of various magnitudes in case of failure or neglect. Loans were to be paid back by quantities of crop, which should correspond to the loan plus its interests. In case of default, however, it may be repaid in terms of free labour depending on the kind of failure. In the normal case of borrowing a loan by a farmer then payment back the loan to the creditor should cover the amount of the loan and its interests in terms of the planted crop. On the other hand if the crop was lost due to inundation of the land or because of irrigation water shortage, then in that year, he shall not make any return of grain.

Other articles covered the misuse of water as in articles 53, and 55 to 56:

“If a man neglects to strengthen his dyke and does not strengthen it, and a break be made in his dyke, and the water carried away the farm-land, the man in whose dyke the break has been made shall restore the grain which he has damaged”.

“If a man opens his canal for irrigation and neglects it and the water damages adjacent fields; he shall pay out grain on the basis of the area of adjacent fields”.

“If a man opens up the water, and the water carries away the improvements of an adjacent field; he shall measure out ten Gur of grain per Gur lost”.



Figure (21): Hammurabi presenting his code to the God Marduk

Moreover, special attention was given to such matters as being careful and avoiding causing damage to the fields by grazing sheep, so articles 57- 58 stipulate:

“If a shepherd has not come to agreement with the owner of a field to pasture his sheep on the grass; and if he pastures his sheep on the field without the consent of the owner, the owner of the field shall harvest his field, and the shepherd who has pastured his sheep on the field without the consent of the owner of the field, shall give over and above twenty GUR of grain per ten GAN to the owner of the field”.

“And if, after the sheep have gone up from the meadow and have crowded their way out (?) of the gate into the public common, the shepherd turns the sheep into the field, and pasture the sheep on the field; the shepherd shall oversee the field on which he pastures and at the time of harvest he shall measure out sixty GUR of grain per ten GAN to the owner of the field”.

Caring for orchards and trees was also covered as seen from articles 59- 65, which had stipulated the following:

“If a man cut down a tree in a man's orchard, without the consent of the owner of the orchard, he shall pay one-half mana of silver”.

“If a man gives a field to a gardener to plant as an orchard and the gardener plants the orchard and care for the orchard four years, in the fifth year, the owner of the orchard and the gardener shall share equally; the owner of the orchard shall mark off his portion and take it”.

“If the gardener does not plant the whole field, but leave a space waste, they shall assign the waste space to his portion”.

“If he do not plant as an orchard the field which was given to him, if corn be the produce of the field, for the years during which it has been neglected, the gardener shall measure out to the owner of the field (such produce) on the basis of the adjacent fields, and he shall perform the required work on the field, and he shall restore it to the owner of the field”.

“If the field be unreclaimed, he shall perform the required work on the field, and he shall restore it to the owner of the field and he shall measure out ten GUR of grain per ten GAN for each year”.

“If a man gives his orchard to a gardener to manage, the gardener shall give to the owner of the orchard two-thirds of the produce of the orchard, as long as he is in possession of the orchard; he himself shall take one-third”.

“If the gardener does not properly manage the orchard; and he diminishes the produce, the gardener shall measure out the produce of the orchard on the basis of the adjacent orchards ^{(6), (7)}.

According to best estimates, the *Gur* was equivalent to approximately 0.3 liters while one *GAN* was about 0.6 square meter ⁽⁸⁾.

Hammurabi was interested in land reclamation and in organizing the agrarian relations and this was manifested clearly in his code, which stated in one article that waste land which was left to be reclaimed by tenants were to be granted rent-free tenancy for three years. Tenants were to pay a stipulated rent in the fourth year. If the

tenant neglected to reclaim the land, the code enacted that he must hand it over in good tilth and fixed a statutory rent. Gardens or plantations were let in the same way and under the same conditions; but for date-groves four years' free tenure was allowed. Similarly, tenancy was organized according to the *métayer* system was in vogue, especially on temple lands. As for the landlords it was their duty to provide the land, oxen for ploughing and the watering-machines, carting, threshing or other implements, seed corn, and rations for the workmen and fodder for the cattle.

The tenant, or steward, usually had another land of his own. If he stole the seed, rations or fodder, the Code enacted that his fingers should be cut off. If he appropriated or sold the implements, impoverished or sublet the cattle, he was heavily fined, and in default of payment might be condemned to be torn to pieces by the cattle on the field; the rent was as contracted ⁽⁹⁾.

Following this golden epoch, and as normal with all empires, the old *Babylonian* Empire started to decline, but it was still looked at with envy by other nomadic Peoples at the edges of the empire due to its richness and prosperity. Finally, *Babylon* itself was attacked and sacked by the *Hittites* in 1595 BC when *Hammurabi's* dynasty was falling apart during the reign of its eleventh king (*Shamso-Detanana*).

The *Hittites* led by their King *Musili* came down from Anatolia, but then retreated to their original homeland shortly afterwards and

were replaced after a short period by other people known as the Kassites ⁽¹⁰⁾.

The extent of the *Babylonian* empire at the time of the *Kassites* invasion is shown in Figure (22)⁽¹⁰⁾. *The Kassites* themselves controlled *Babylonia* for 386 years from 1531 BC until 1155 BC, and established a dynasty based first in *Babylon* and later in *Dur-Kurigalzu* near the confluence of the Tigris and Diyala rivers, about 30 kilometres (19 mi) west of the center of present day Baghdad. It was founded by the *Kassites* king of *Babylon*, *Kurigalzu, I* in the late 15th or early 14th century BC.

The original homeland of the *Kassites* is not well known. It appears to have been located in the Zagros Mountains, in what is now the Lorestan province of Iran. The circumstances of their rise to power before entering *Babylon* are unknown due to a lack of documentation during this so-called "Dark Age" period (1595-1531BC), which was due to widespread dislocation. No inscription or document in the *Kassites* language has been preserved, an absence that cannot be purely accidental, suggesting a severe regression of literacy in official circles.

The success of the *Kassites* was built upon the relative political stability that the *Kassites* monarchs achieved. They ruled *Babylonia* practically without interruption for almost four hundred years, which is the longest rule by any dynasty in *Babylonian* history. Those kings were members of a small military aristocracy but were efficient rulers and not locally unpopular, and their 400-year reign laid an essential

groundwork for the development of subsequent *Babylonian* culture⁽¹¹⁾.



Figure 22: Babylonia, at the time of the Kassites ⁽¹⁰⁾

The location of old *Babylon* and *Dur- Kurigalzu* are shown in the map of Figure (23). This map shows also the old *Sumerian* cities with their present names as archeological sites given between parentheses. This map even shows the modern cities of Basra, Karbala, Baghdad, and Samara for good reference ⁽¹²⁾. In the maps of Figure (22) and Figure (23) it is worth to note the old courses of the rivers' Tigris, Euphrates; and Karkha which had also poured out directly into the Persian Gulf at that period.

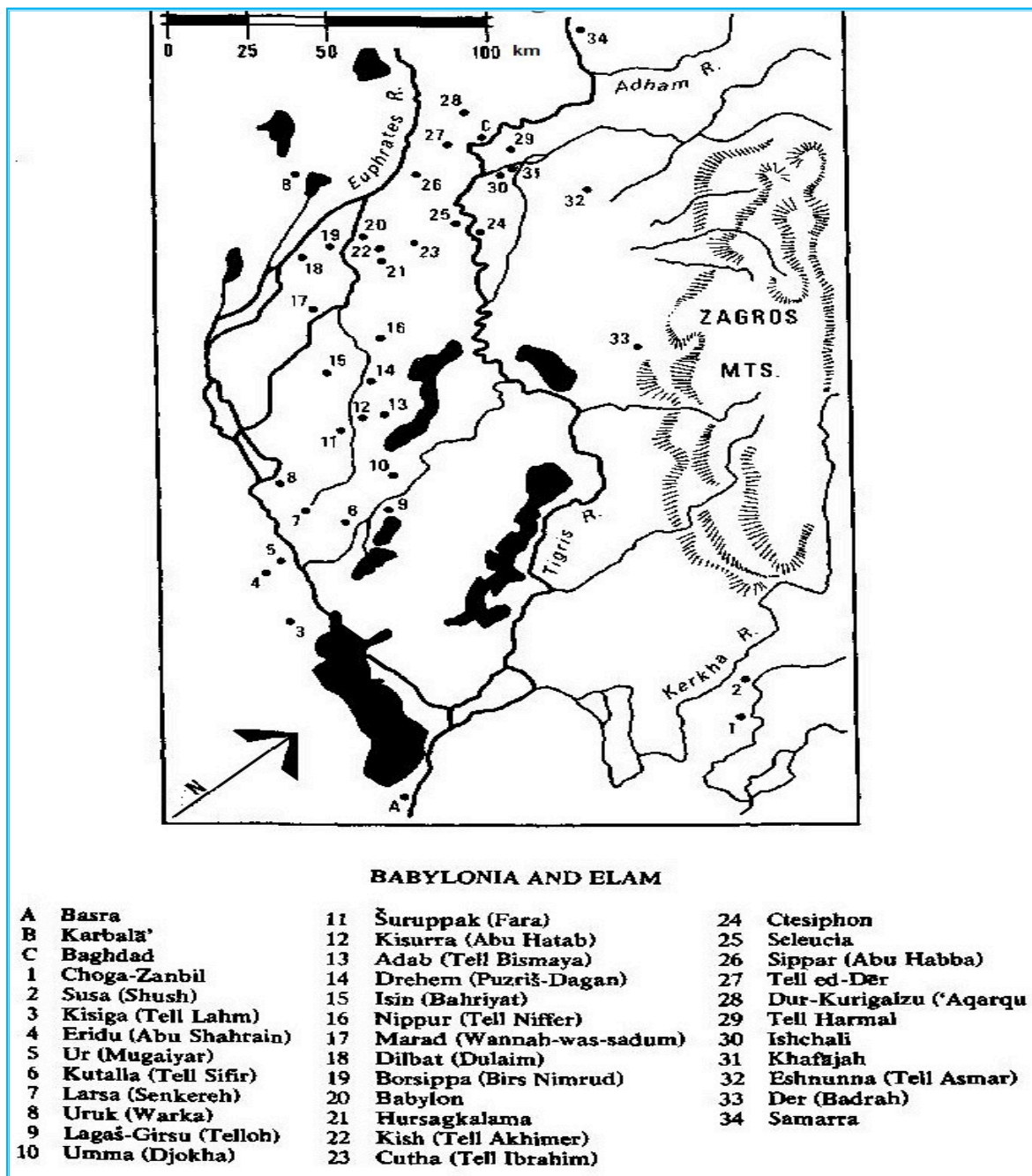


Figure 23: Map showing locations of Babylon (20), Dur-Kurigalzu (28) and other old cites of Sumeria with their present archeological sites in parenthesis; in addition to some modern Iraqi cities ⁽¹²⁾. Note: The unit of measurement on the scale shown on this map has been corrected from (m.) in the original map to (km.) by the writer, and the notation on the arrow has been also changed showing north from (MIN) to (N).

To the reader of this history, it is of great interest to observe how this part of the world had in so many times attracted outside invaders, who in most cases were ravaging barbarians looking for the wealth

and rich resources of the Mesopotamian civilizations. It is not surprising, therefore, that the *Kassites* themselves were thrown out by a new invading wave of people; this time the *Elamites* (1168 BC-1162B C) who were the new *Babylonians*.

The *Kassites* however, should be credited for the fact that during their four hundred years, or so, they had acquired the *Babylonian* knowledge and utilized it for their own benefit. In engineering they maintained and kept the irrigation works in good and functional conditions. So, they passed this knowledge again to the new *Babylonian* dynasty which conquered them and drove them out of *Babylonia*. These new *Babylonians* of the *Elamites* remained in power for the next 131 years and had eleven of their kings on the throne of the *Babylonian* Empire until this empire gave in under the increasing pressures of the newly rising empire of *Assyria* in 931 BC.

During the flourishing period of the *Babylonian* supremacy, major engineering water works were accomplished, either as newly constructed ones or by extending and improving others inherited from earlier periods. While we have not received much written information on who were the kings responsible for these works, archeological findings show that these major works took a long time to be completed; which indicates probably that many successive kings worked on each of them. Such of these large projects were; the *Great Nimrud Dam* and the *Nahravn Grand Canal*. The dam that was called *Nimrod Dam* on the Tigris was an earthfill dam built around 2000 BC., north of Baghdad and was used to prevent erosion and

reduce the threat of flooding. The intention was to divert the flow of the river and help irrigate the crops ⁽¹³⁾. Historical evidence reveals that the Tigris River in its course south of the city of Samarra had two branches at a point located at the entry of the river into what may be considered as the beginning of the alluvial plains of Mesopotamia.

The bulk of flow used to flow in the western branch in a southwesterly direction, while the remaining flow went into the eastern smaller channel, and after some 100 kilometers it turned to the east to meet with this eastern branch at a point north of the modern city of Al Kadhimiah. However, later on, and as normal for rivers in fluvial deltas changing their courses and taking new channels for many reasons; the Tigris abandoned its main course to flow through the eastern smaller branch; which became the main stream. This event resulted in depriving the other branch from its share and cutting off water supply of the extensive irrigation network depending on it.

Here, there are two different opinions on the reason for this change; the first was held by Sousa ⁽¹⁴⁾, in which he claimed that it was brought about by a very high flood which caused the diversion into the eastern channel which was generally lower than the other one. Sir William Willcocks, the British engineer who had studied the conditions of irrigation in Iraq in the late years of the nineteenth century for the Ottoman Government, advocated, however, a second opinion. Willcocks believed that; as it was normal for such rivers, both branches were eroding and cutting deeper into their beds due to the general change of the ground grade. In addition, while this process

had continued along the eastern branch unhindered, it was stopped at some level in the western branch due to the presence of one bed of very hard rocks, which are most probably conglomerates. This had caused the rising of water level at the head reach above that in the eastern channel and resulted in overflowing of the river into this channel⁽¹⁵⁾. The ancient engineers had to think of a way to solve the problem of water shortage along the western bank, and the solution was to build the “*Grand Nimrud Dam*”.

Things could not have stopped at just building the dam because those same engineers had also to organize the irrigation of the lands along this branch and extending irrigation to all the domains up to the foot hills in the east, and carry this down to the south as much as possible. A new Grand Canal was then dug taking water from the Tigris River to replace all the feeder canals that were taking their supplies from the eastern branch; this was the *Grand Nahravn Canal*. Our knowledge of this work comes from an inscription on a cylindrical seal which was uncovered in the ruins of (*Khafaji*) east of Diyala River between *Baquba* and Baghdad, which belonged to the time of King *Shamsu Elona* the son of *Hammurabi* ⁽¹⁶⁾.

The *Grand Nahravn Canal* had then two intakes connected to two head reach canals not only one. As usual, practice for all ancient engineers of Mesopotamia, even at the *Sumerian* era, as they used multiple intakes to supply the same canal, whereby the upstream intake had a relatively low bed level and drew the water supply when the water levels were low throughout the summer season, the

downstream intake with its higher bed level took care of water supply during winter season. In this way, permanent gravity irrigation was maintained during the four seasons. According to this practice, the *Nahrawn* Canal had its upper intake at about 11 kilometers south of Sammara. This canal head reach is still known by the name “*Al Qaim*” as for the other lower intake it was feeding what is called the “*Nahr Al Sanam*” canal, which later on merged with “*Al Qaim*” to form the main Al Nahrawn Canal, Figure (24)⁽¹⁷⁾.

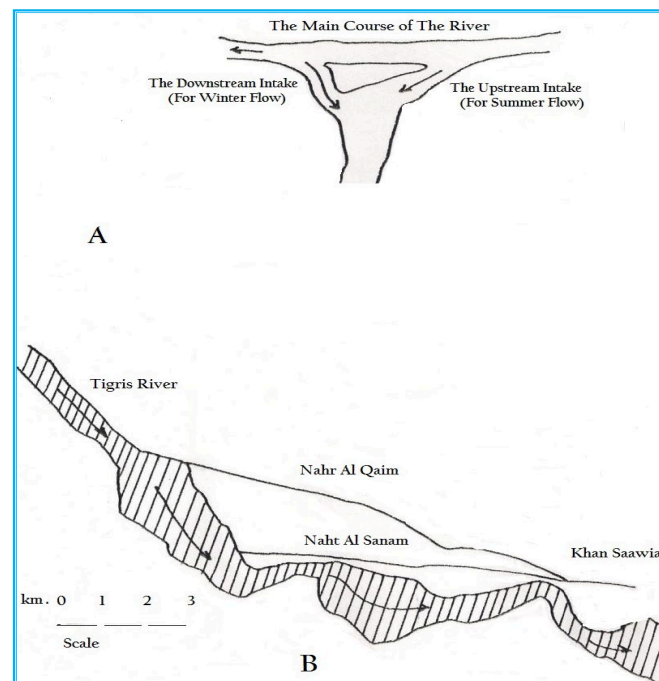


Figure 24: Schematic diagram, (A) The arrangement of the upstream and downstream intakes, (B) Sketch showing the Al Qaim and Al Sanam head reach canals ⁽¹⁶⁾.

Note: This sketch was edited and translated from the original Arabic by the writer.

The construction of the *Grand Nimrud Dam* involved colossal magnitude of work and great deal of planning. In considering the size of the “*Grand Nimrud Dam*”, we should remember that this dam had to be of such volume and workmanship as to resist the enormous Tigris floods, which from our hydrological calculation can reach up to 12000 m³/second. The dam continued to function for about three

thousand years, and its destruction and progressive abandonment lasted from the mid-10th century onwards mirroring the *Abbasid Caliphate's* decline.

Similarly, the volume of excavation, the construction of the many weirs and other structures plus the precise surveying works, all gave evidence to the greatness of the *Grand Nahrwan canal*. Maintaining the canal for thousands years and keeping it functional all this time indicates the value that was attached to it. The enormous crop yields and revenues to the empires that dominated the land showed the reward paid back. This was the case for over thousands of years until it fell into disuse with the collapse of the *Grand Nimrud Dam*. Although some later authors attribute the construction of both the dam and the canal to the later Sassanids ⁽¹⁸⁾, archeological findings prove without the slightest doubt that they were two of the great achievements of *Babylon*.

However, in going back to the *Babylonian* period, this era was very important in the history of Mesopotamia, as it marked the time when the first Mesopotamian Empire was established. In *Babylonia*, all the accumulated knowledge and expertise acquired by the previous dynasties were made use of and developed even further. The main actors during written history before *Babylonia* were the *Sumerians* and *Akkadians*, who had so much intermingled with the new comers, the *Amorites*, and later on the *Kassites* through marriage and blending together, that they all had become one nation.

This one nation has adopted the *Semitic-Akkadian language* and used it for economic transactions during the *Kassites* period, and used *Sumerian* language for monumental inscriptions. Traces of the *Kassites* language itself however, are very few. Old *Babylonia* reached its golden stage at the hands of the *Amorite* King *Hammourabi* and continued to flourish at the hands of the *Kassites*.

During the *Babylonian* era, which extended well of about 1000 years, one does not fail to observe that the land of Mesopotamia had thrived in spite of the many wars and dark periods that it had to go through. Many Peoples of the ancient world made this land their home. *Sumerians*, *Akkadians*, *Amorites* and *Kassites*; Semitics and Aryans, melted together to be *Babylonians*, and they worked hard to maintain their prosperity. Such prosperity could only be attained by agriculture and the surpluses it brought with it. Agriculture depended on irrigation and the *Babylonian*, not only, had to maintain the water flowing in the canal networks they inherited from the *Sumerians*, but also excelled in extending them. The sources of the water were the Tigris and the Euphrates, two wild rivers, when compared to the mild Nile.

The men of Mesopotamia had to be of such strength, vigor and patience to be able to control them. They did not waste time building flood protection dykes; or when such dykes breached, they did not lose hope and did their best and started all over again. The two rivers changed their courses many times during the *Sumerian* and the

Babylonian periods; again, this meant building new canals and shifting their cities every time such an event occurred.

When now, after such long time had passed, and even with other civilizations taking over this heritage and building over it, good things always end. Finally, luck turned against the people of Mesopotamia, being due to wars or weather changes and droughts. This great work turned into waste, and the landscape became dotted with numerous mounds and old embankments that speak of the glorious past, but only in a language known to a small group of great men who took it up to themselves as dedicated archeologists to dig and decipher their secrets. If we are so lucky to write on this now, it is only because of the hard work and toils of these men.

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The Neo- Assyrians, Warriors and Canal Builders under Sennacherib (911- 609BC)

As we follow the history of agriculture and irrigation in Mesopotamia, this history continues to unfold more of the intriguing past to us. In addition, it is clear that agriculture and irrigation development cannot be isolated from the social and political settings of the Peoples, who developed them. Therefore, we find ourselves when we come to study both irrigation and agriculture in past Assyria, obliged to describe even if briefly, the background of these active and energetic People, who made history for more than one thousand years in the ancient world.

The *Assyrians* were *Semitic* people who had inhabited the plains of upper Mesopotamia around the city of Mosul on the Tigris River. This was sometime between 4000 BC and 3000 BC, and they made the city “*Ashur*” as their capital at the end of the third millennia BC. It was named after their god “*Ashur*” and its remnants can still be seen now on the right bank of the Tigris River near Al-Shirqat.

The earliest *Assyrian* kings were relatively minor rulers. After the founding of the *Akkadian* Empire, which lasted from 2334 BC to 2154 BC, these kings were subjugated to *Sargon* of Akkad, who united all the Akkadian and Sumerian peoples of Mesopotamia (including the Assyrians) under one rule.

In their long political and military struggle against other Peoples like the *Akkadians*, *Hittites* and *Hurrians*, the *Assyrians* managed in the end to unite and establish the “*Ashur kingdom*” until they were subjugated again but this time under the *Babylonian King Hammurabi* in 1595 BC. Next to that, there followed another period of their power rise from 1365 BC to 1074 BC that included the reigns of kings such as *Ashur-uballit I*, *Tukulti-Ninurta I* (1244–1208 BC), and *Tiglath-Pileser I* (1114–1076 BC).

Ashur-uballit extended the *Assyrian* control over the rich farming lands of *Nineveh* and *Arbela* to the north. *Tiglath-Pileser* controlled the lucrative caravan routes that crossed the Fertile Crescent from the Mediterranean to the Persian Gulf. Much campaigning by *Tiglath-Pileser I* and succeeding kings was directed against *Aramaeans* pastoralist groups in Syria, some of whom were moving against *Assyrian* centers. After the death of *Tiglath-Pileser I* in 1076 BC, *Assyria* was in comparative decline for the next 150 years. But following the conquests of *Adad-Nerari II* of *Babylon* in 911 BC, *Assyria* emerged as the most powerful state in the known world at that time, coming to dominate the ancient Near East, including the East Mediterranean, Asia Minor, Caucasus, and parts of the Arabian Peninsula and North Africa ⁽¹⁾. The map in Figure (25) indicates the extension of the *Assyrian* Empire during the various periods of its expansion.

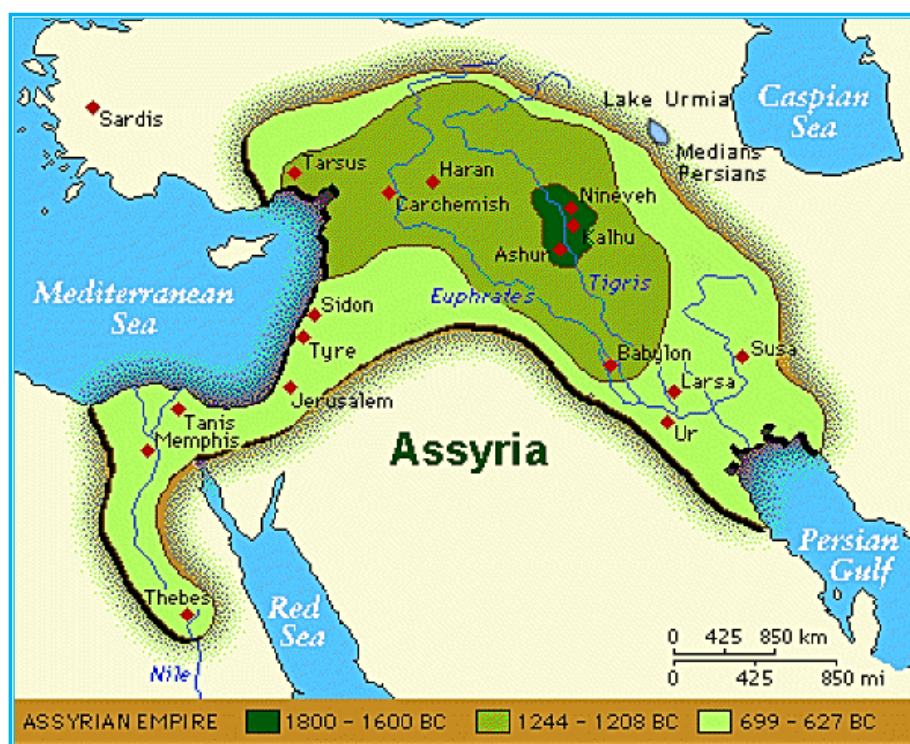


Figure 25: The Assyrian Empire during various phases of its history ⁽²⁾.

The *Assyrians* were warriors and fierce fighters but not much of farmers not like the people of lower Mesopotamians. Their land east of the Tigris River was undulating and hilly, which extended to the Zagros mountain foothills. Their agriculture was mainly growing rain fed winter crops of wheat and barley helped by the good rainfall that characterized this region. Irrigation was limited to small plots of lands and orchards on the rivers' banks or around springs and “*Kariz*” tunnel systems in the more hilly or mountainous locations. Their herds of sheep and goats had plenty of fodder at the lush planes and slopes of those hills. No elaborate irrigation systems, like those in lower Mesopotamia were needed, but the *Assyrians* needed to bring adequate quantities of water to irrigate those lands suited for permanent cultivation and to supply

their many cities with water, and so they established themselves as great engineers and builders of canals, weirs, aqueducts and even tunnels.

During these years, the *Assyrians* continued to have the city “*Ashur*” as their capital until it was moved by *Ashurnasirpal II* (Reigned 884-859 BC) to the city of *Kalhu* (*Calah/Nimrud*). It was moved again by King *Sargon II* (Reigned 722–705 B) to *Dur-Sharrukin* (present day Khorsabad) which was again moved to *Nineveh* by his son *Sinnecharib*, (Reigned 705- 681 BC). Figure (26) shows the heartland of *Assyria* and the location of the four capitals.

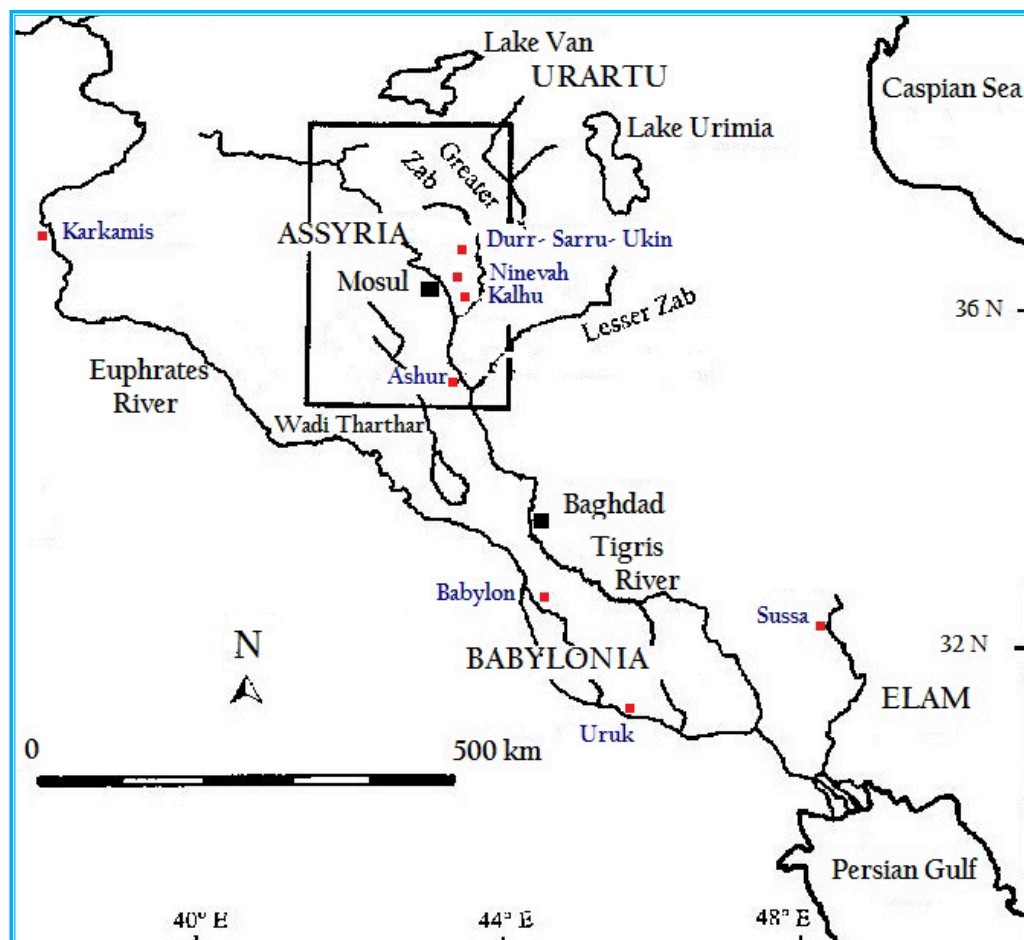


Figure 26: Location of the capital towns of the Assyrian Empire (Ashur, Dur-Sharrukin, Neniva, and Nimrud). Present day towns are also shown ⁽³⁾.

The *Assyrians* were gifted inventors and energetic engineers. Some of their inventions stemmed from their militarism. For despite the harm it does in other directions, war certainly stimulates technology, which it did even at those times. Of these inventions, some examples can be cited. These are: equipping armies for the first time with iron weapons, developing the remarkable war chariot pulled by fast horses, introducing cavalry in their armies, using ladders fixed on heavy wooden frameworks and protected on the sides and top by boarding to shield their attacking soldiers from enemy arrows when scaling enemy fortresses walls, and even developing heavy battering rammers hanged on wheeled carriages to break enemy city gates.

In addition to developing engines of war and cavalry the *Assyrian* kings found time for peaceful public works. When *Srgon II* (722BC- 705BC) invaded Armenia in 714 BC he saw for the first time the irrigation systems not yet known in Mesopotamia, which is referred to in Persian as “*Kariz*” or “*qanāt*”. So *Sargon* made sure that such systems were constructed and used where they were needed in the empire, which they proved to be very practical and useful. A “*qanāt*” or “*Kariz*” is a sloping tunnel that draws water from an underground source in a range of hills down to dry plain at the foot of these hills. It has an advantage over open air aqueducts in that less water is lost by evaporation or leakage on its way from these hills to the plains, in addition to exploiting ground

water in a good and efficient way.

To build a “qanāt”, number of vertical shafts is dug along the course of the proposed conduit, and a continuous tunnel joins the bottoms of these shafts. At various points, other shafts are excavated at a slant from the surface to get access and maintain the tunnel. Finally when the tunnel is completed and reached its destination, the flow of water is collected in a basin to be distributed to the distribution system of the irrigation channels, Figure (27) ⁽⁴⁾. Kariz system was, however, only one way of the many other methods utilized in *Assyria* in their water works projects as will be seen later in this chapter.

In *Assyria*, it was seldom that the *Babylonian* or *Sumerian* system of irrigation could be found applicable, where water was simply derived from the rivers by side-cuts, leading it off by gravity from the natural channels to the flat alluvial lands. There was but little of *Assyria*, which could be irrigated by this simple kind of application. In eastern *Assyria*, between the Tigris and the mountains the land was generally undulating, and much of it stood at a considerable height above the various streams. Water, therefore, was required to be raised from the level of the rivers to that of the land before it could be used, or otherwise, it was to be drawn from upstream locations to downstream areas to avoid lifting. The *Assyrians* endeavored to provide some sophisticated hydraulic arrangements to accomplish this. Apart from digging canals from far distances to get the required command, these

canals had to cross natural wadis by aqueducts of one kind or another. Moreover, where conditions were favorable, the *Assyrians* also constructed long and elaborate tunnels for *Kariz* conduits systems. The *Assyrians* might occasionally, like some of their modern counterparts, have employed the labour of animals to raise limited quantities of water by driving waterwheels; but historical evidence indicates that such use was limited. Similarly, we do not trace the use of water-wheels on rivers like those employed on the Orontes (A'sse River in modern Syria) or on upper Euphrates in Anna and Allus in Iraq).

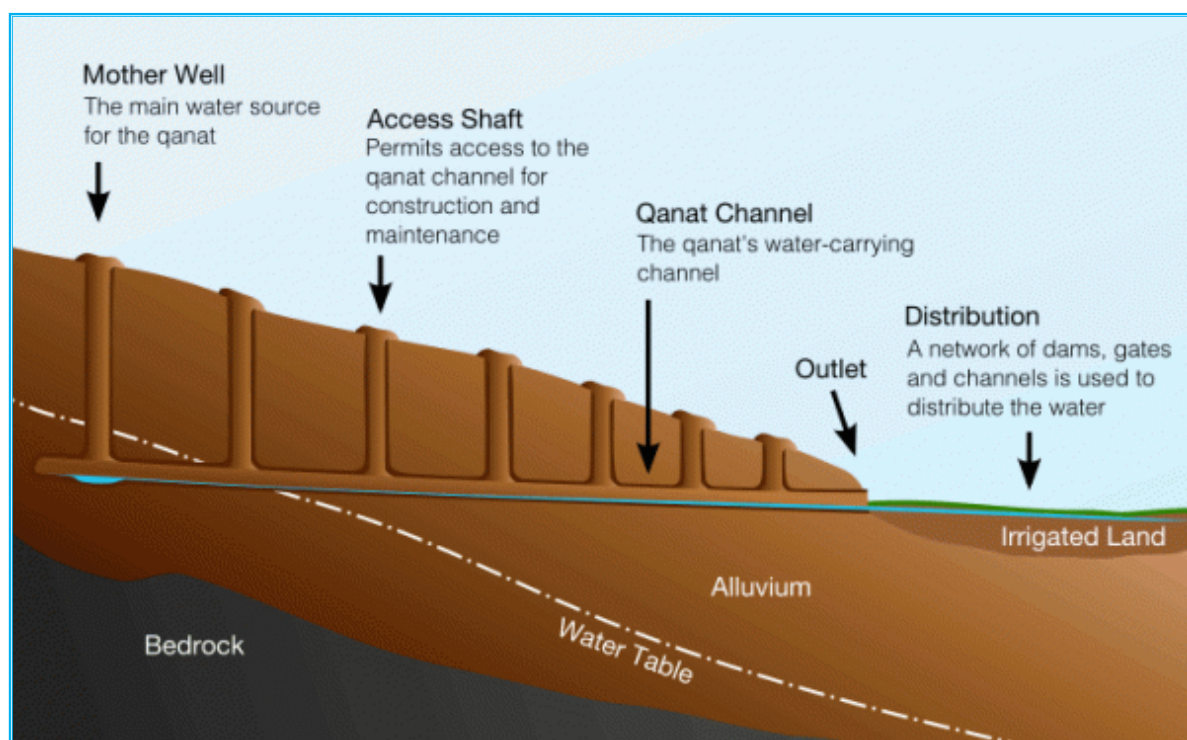


Figure 27: Details of a “Kariz” system ⁽⁴⁾.

Assyrian kings were challenged by the difficult nature of the territory to construct elaborate schemes to bring water to their cities and to irrigate the land around them; therefore, it is not strange to see great water works built by them around those cities.

Ashur, the first capital of the *Assyrian Empire*, was located on the Tigris River as this was shown in Figure (26). It did not need water supply from another source, but the capital was changed later on to “*Kalhu (Nimrud)*” by *Ashurnasirpal II* who reigned in (884–859 BC), then to “*Dur-Sharrukin*” by *Sargon II* and finally to “*Nineveh*” by his son *Sennacherib* (705- 681BC)⁽⁵⁾. *Sennacherib* moved to *Nineveh* and took it for home as soon as he rose to the throne. He himself was a dreamer who liked to model things to his liking and taste. His desire for greatness drove him to build the new capital with its magnificent architecture; and his love for lush fields and gardens incited him to look for enough water resources to irrigate them.

To speak of the town planning, he surrounded the city with a huge wall faced with stone and pierced by fifteen gates, which embraced the two mounds on which the temple and palaces stood. The rest of the area was an irregular quadrangle about one mile from east to west and three miles from north to south, and it was occupied not only by dwellers of the common folk, but also by public parks and orchards of private citizens. In Figure (28) the map shows the *Nineveh* wall and its fifteen gates. On this map is also shown the location of *Nabi Yunis Mosque* (destroyed in 2014 by ISIS) which was built on the site of the tomb of Prophet Jonah, who was sent by God to prophesy the destruction of *Nineveh* and to warn the *Ninevians*; according to the story of the Bible. Also seen from the map the *Tebitue River* (present day Al- Khosr River)

which penetrates the city ⁽⁶⁾.



Figure 28: Map showing Nineveh great wall with its fifteen gates ⁽⁶⁾

During the rule of *Sinnecharib*, *Nineveh* expanded in area from 150 ha to 750 ha which indicates the magnitude of development it attained during this period ⁽⁷⁾. To water all the fine plantings and orchards, *Sennacherib* undertook the construction of vast schemes of water works. He personally toured the countryside near *Nineveh*, striding over mountains, to choose the sites of his constructions. Ten miles north of *Nineveh* near a village that was called *Kisiri*, near the present day's village Qayin; he dammed the river *Tebitue* (Al Khosr River) which flowed from the north and

ran through the middle of Nineveh and emptied into the Tigris just to the west of the city. From the reservoir thus created he brought a canal down to the city. Since the grade of this Kisiri canal was less than that of Tebitue River, the canal water reached to the city at high enough elevation to be used for irrigation without hoisting.

To take care of the flood overflow during the high water season in spring, *Sennacherib* installed, northwest of the city a municipal canebreak or weir, like those of *Babylonian* cities, so water could be diverted to lower land, which turned into a shallow marsh. In the year 702BC, and again in 700BC, *Sennacherib* had visited the marshes of southern *Babylonia* in his pursuit of *Assyrians'* enemies, and he was so impressed by their beauty and the scenery, which must have taken hold of him. He turned the marsh he had created into a game reserve, releasing deers, and attracting wild boar and game birds to breed there. In addition, he planted thickets of reeds and timber trees, and he introduced so many types of herbs and plants to grow ⁽⁸⁾. Two years after *Sennacherib* accession to the throne, in 703BC, he was able to speak of the first results:

“To make the orchards luxurious, from the border of the town of Kisiri, to the plains of Nineveh, through mountain and low land, with iron pickaxes I cut and directed a canal. For a distance of (1 ½ bëru) I caused the flow there everlasting waters from the Tebitue). Inside those orchards, I made them run in irrigation ditches”.

Sennacherib first canal sufficed for many years. When the city expanded further, the king himself went out to investigate new sources, and he succeeded in locating many springs and pools around mount *Musri* (Present day Jebel Bahshiqa). The springs were enlarged, and the pools turned into reservoirs from which one canal carried the water down to *Tebitue*. From archeological diggings, it seems that the canal went by the present day village Bahizani very close to Bahshiqa and emptied in the Khosr upstream of the marsh. More diggings revealed the remnants of two dams that crossed the *Tebitue* which were built of square stone blocks. The lower of these two dams must have marked the place where water was sluiced to the marsh.

In this grand scheme, it seems from recovered inscriptions that there were about eighteen of such canals, which *Sennacherib* had excavated. However, in his wild ambitions, one of these canals turned to being the grandest of them all, which was the *Bavian-Khosr* canal. *Sennacherib* went more than thirty miles from *Nineveh*, to the water shed of *Atrush* or *Gomel* River, thence; a canal was dug over land to the head weir of the *Tebitue* to carry the new supply of water to *Nineveh*, marking, maybe, the first inter-basin water transfer project in history. Where the canal carried the water from the *Gomel* River, near *Bavian*, *Sennacherib* had to build an aqueduct to cross a large Wadi, near modern village Jarwan, which may be considered as real wonder at that time. The map in Figure (29) shows the layout and extent of this grand

project.

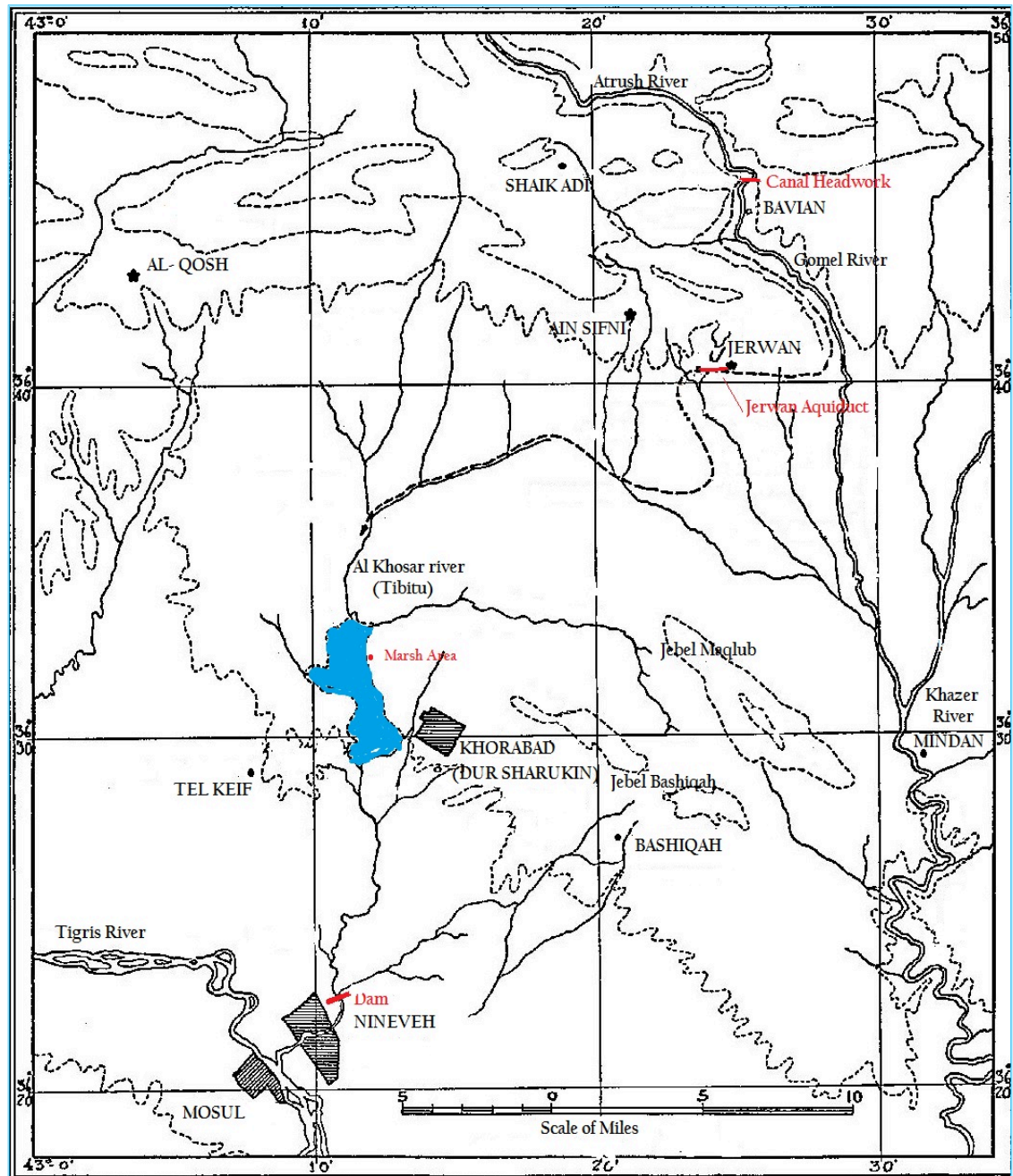


Figure 29: Map showing the layout of Sennacherib Nineveh water project ⁽⁹⁾

Note: This map is edited and all names are translated from the original Arabic into English by the author

In 1934, Thornkild Jacobson and Seton Lloyd of the

University of Chicago Oriental Institute expedition in Iraq undertook the archeological excavations at the Bavian Canal course and head works. The site investigation of *Jarwan aqueduct* itself was completed one year before that by the same archeologists, and the results of their work were reported in their book “Sennacherib’s Aqueduct at Jarwan”⁽¹⁰⁾, from which most of the material here is drawn.

The site of head works of *Bavian Canal* was selected in a gorge through which the *Atrush River* flowed and emerged out in a new name as the *Gomel River* before it entered an open country near the present village called Khinis. This site location was an ideal place from engineering point of view to construct such a dam to create a reservoir and to place the canal intake as can be seen from the photograph of Figure (30) and the map of Figure (31).

The photograph of Figure (30) shows the gorge at *Bavian* looking south, and showing the river course and the recent village of Khinis on the hill at the far right side of the picture. The dam axis is marked on the photograph with a red line, and the location of the intake of the canal is indicated. When *Sennacherib* finished construction, he placed a huge monument at the intake of the canal. *Sennacherib* made sure that the history and greatness of the project and his own were inscribed and carved on it. But during the passage of thousands of years this monument tilted and fell into the river and so blocked the entrance to the canal. This monument can be seen in its tilted position on this photograph.

The location of the dam, the sluices and the head reach of the *Bavian Canal* are shown in Figure (31). This map shows also that the dam site is located downstream of a small modern weir supplying one recent irrigation canal. From the sluiced intake, the *Bavian Canal* ran along the side of the adjoining cliff, and had a width of six meters; its bottom was lined with cut stones and had a parapet at the riverside.



Figure 30: Location of the dam on the Gomel River showing the Mountain scarp overlooking the site on which inscriptions and sculptures were carved commemorating this work; the canal intake is also shown blocked by falling monument which stood at the entrance side⁽¹⁰⁾, (Modified and marked by the writer)

As the canal ran a short distance in the downstream direction, it had to penetrate a spur of rock, which obstructed its alignment. This did not stop the engineers from excavating a tunnel through this spur to pass the canal through, which indicated they were technically prepared and equipped for performing such work.

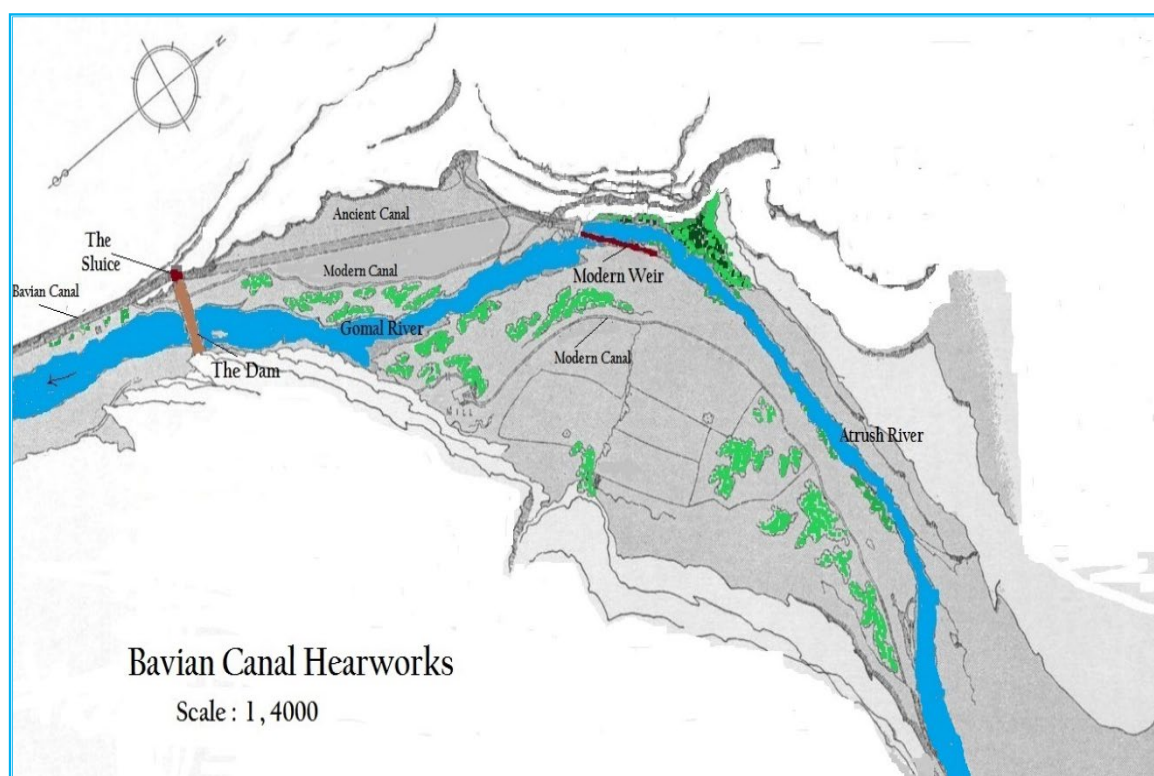


Figure 31: Map showing location of dam on the *Gomal River* and the intake of *Bavian Canal*¹⁰ (Modified by the Author)

The entrance to the tunnel and part of it was uncovered during the archeological works that were done in 1934, and Figure (32) shows this tunnel during excavation. The inside dimensions of the tunnel were (1 x 1.5 x 2) meters, and it was cut into the vertical face of the rock. It was not possible to dig the whole length of the tunnel by the expedition due to shortage of time, so its full length is not exactly known, but the trace of the canal itself could be

found some distance downstream. The aerial photograph in Figure (33) taken in 1955 by another expedition indicates the locations of the weir and this tunnel. Speaking again of the entrance monument of the intake, Figure (34) shows some of its details, its location with respect to the weir, and the canal and even shows it in its tilted position.

As the canal emerged from the tunnel, it followed the topography of the ground in south easterly direction as was shown in the map in Figure (29), where its remnants can still be seen near many of the existing villages. One example is observed at 1500 meters east of the village called Shefsheren where the width of the canal appears to be 19 meters.

In its course down to the Khosr river at a bout 30 miles distance, the canal crosses many Wadies on aqueducts which were built of limestone blocks, but the largest and greatest of them all was the one at the crossing of the main Wadi forming one of the *Gomel River* tributaries close the village *Jarwan*. The aqueduct, therefore, was given the name of this village in the writing of all the archiologists who investigated this project.



Figure 32: Photograph showing the Excavation of Bavian tunnel ⁽¹⁰⁾.

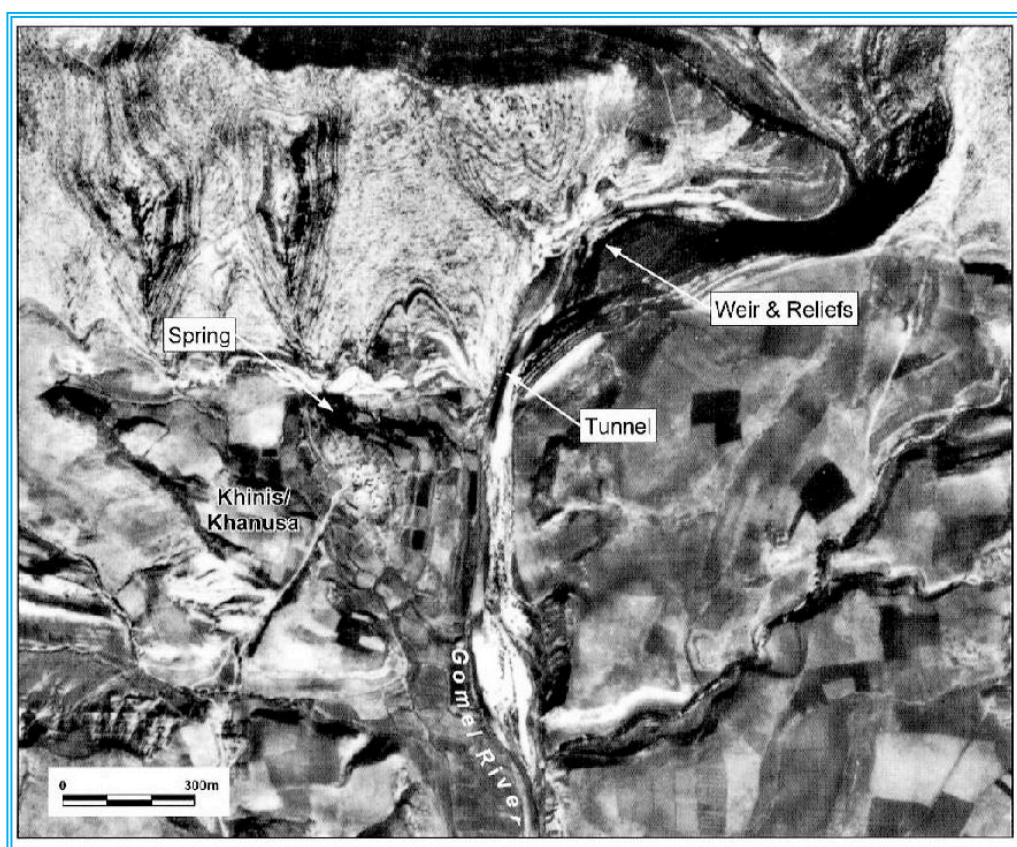


Figure 33: Aerial Photograph (spring 1955) of the Gomel Gorge near Khinis ⁽¹¹⁾.

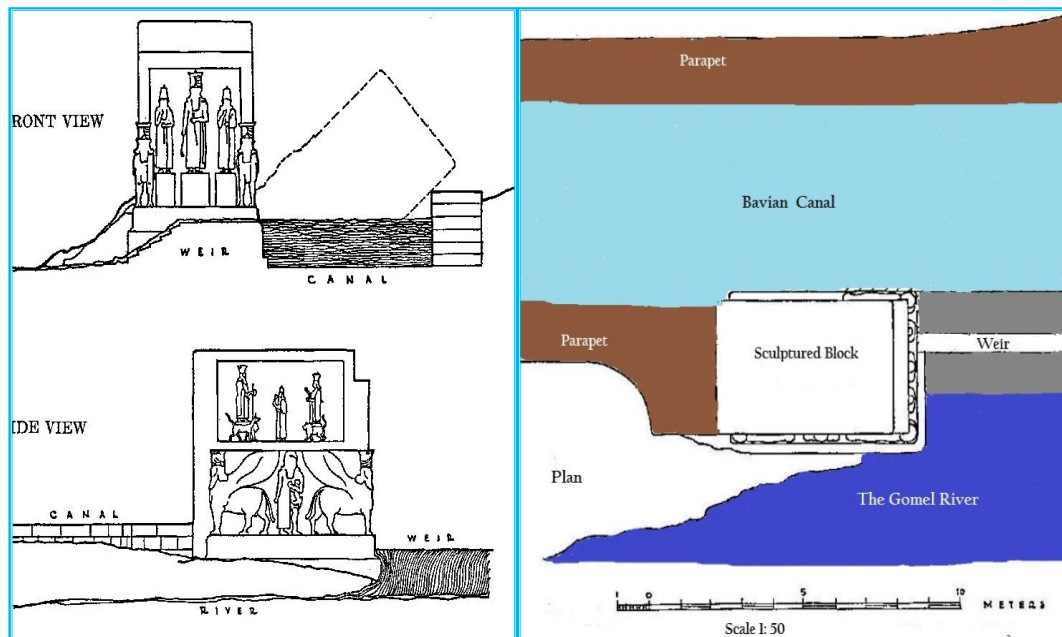


Figure 34: At the left, front and side views of the monument are shown. At the right, plan of the canal head headwork are shown with respect to the Gomal River⁽¹⁰⁾

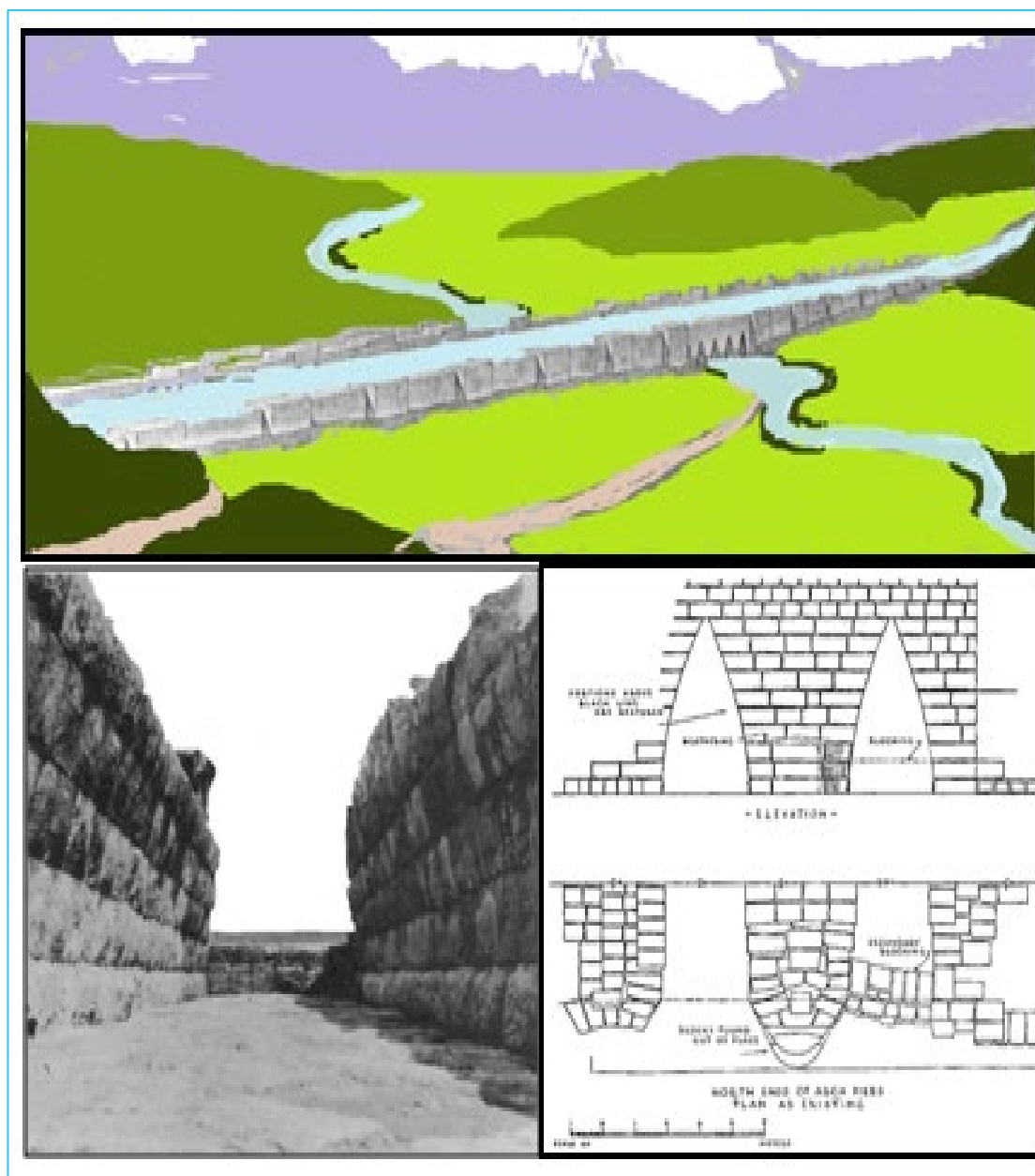
The aqueduct is formed of a large construction of solid stone masonry wall of twenty meters width and a height of nine meters at the wadi section which slopes upwards gradually to the west and even more gradually to the east. For stability the structure is supported by fifteen buttresses along its length on each side. Where it crosses the Wadi, it has five openings in the form of pointed arches to pass the flow of the wadi. The two end openings, however, have about one meter high cross walls in the form of sills closing the bottom part of the openings so as to concentrate the flow of the wadi through the middle three openings until the flow overtop these sills, as shown in Figure.(35) (bottom left). As for the width of the aqueduct without the buttresses it is twenty

meters, and its length from one end to the other is two hundreds and eighty meters, so one can realize what great volume of masonry which is involved.

If we assume the blocks of stones to average rather less than 50 centimetres cubed, the number of stones used would be well in excess of two millions. The masonry was built solid from the foundation up to the point little below the canal bottom level where a layer of concrete of 40 centimetres thickness was laid to grade and the stone pavement was placed on it so that the grade of the canal bed was established at a slope of 1 : 80, and one parapet of one meter width was constructed along each side to contain the flow. Analysis of the concrete used was made at the British Building Research Station which established that the matrix consisted from magnesium limestone aggregates mixed with loamy sand, which was cemented by magnesian lime made by burning magnesium limestone and mixed with water. The ratio of aggregate to lime was estimated to be 4 : 1 by volume ⁽¹⁰⁾. In laying the foundations of the piers, rectangular beds of rough boulders were laid a little beneath the stream level, large enough to accommodate the six piers which were to support the arches. The boulders were surmounted by a level pavement composed of big stones laid diagonally to the direction of the flow of the Wadi in order to increase their stability in time of flood, and from this rose the piers themselves. Similar beds were evidently prepared for the foundations of the remaining structure ascending the two sides of

the wadi; the excavation was made in steps on which the foundations were laid in similar way as those of the piers. At the top of Figure (35) an artist's impression of the aqueduct is shown. Photograph of the remains of one arch is also shown at the bottom left of the figure, while the right bottom sketch details the remains of some of the arches.

One later study of the *Sennicharib* canal system was performed by the Department of Archaeology at Harvard University, and its report was published in July 2005⁽¹¹⁾. The study utilized two remote sensing data sources in following the course of the canal and some of its details.



**Figure 35: Jarwan Aquiduct views;Top: Artist Impresion of the aquiduct;
Bottom left: Remains of arched way looking upstream showing step at the end,
Bottom right:Cross section and plan of arched ways (scale 1:100) (10)**

The first was a set of photographs of an air survey which was completed by the Iraqi Government in 1955; the second was a collection of photographs, which were declassified by the American Intelligence programs, and obtainable through US geological Survey website. The study showed in details the

remnants of *Sennicharib's* irrigation project, including the *Bavian* weir, the remains of the canal and the location of *Jarwan aqueduct*. In addition to these achievements many other water projects were attributed to *Sennicharib* such as *Maltai Canal*, believed to have been supplied with water from *Rubar Duhok* River to the north from *Nineveh*, and similarly the *Faida canal*. Table (1) summarizes *Sennicharib's* canalization works related to *Nineveh* system giving lengths of canals, year of construction and average grade of the canals. The *Musri System* (Jebal Baqshiq system) which we have mentioned in the context of the first extension of *Tibitu (khosr) – kisiri* extension is also given in this table (11).

Table1: The Four Stages of Sinnecharib's Canal System

	Stage	Year	Length (Km)	Gradient (m/Km) Km
1	Kisiri Canal	702BC	13.4	0.95
2	Musri System	694BC	-	-
3	Northern System	690BC	46.4 Total	
	Maltai		4.2	0.4
	Faida		9.7	1.6
	Bandawi		5.0	0.8- 1.0
	Uskuf		4.4	1.2
	Tarbisu		23.1	0.6
4	Khunis (Bavian)	690- 688BC	55.0	0.90 Gomel-Gerwan)

In another part of *Assyria*, in the land lying between the lower course of the Great Zab River and the Tigris, the important town of *Kalhu* (now Nimrud) was located, as indicated on Figure (29). It was found by king *Shalmaneser I* (1263-1234 BC). However, the ancient city of *Ashur* remained the capital of *Assyria*, as it had been since about 3500 BC. The city of *Kalhu* (Nimrud) however gained fame when king *Ashurnasirpal II* (883- 859BC) made it his capital at the expense of *Ashur*.

In the tract of land around the city the remains of a canal network undoubtedly, *Assyrian* was found. This land was partly alluvial but more generally of secondary formation of hard gravel, sandstone, or conglomerate. The exact date of the canal's construction cannot be exactly ascertained, but in the most probable case could have been constructed by *Shalmaneser I* to bring water to the new city and to irrigate the land around it. One thing is certain with respect to this irrigation system, that is; it was renovated and maintained later on by King *Sinnecharib*.

The main canal was carried for a distance of more than twenty-five miles from a point on the Khazer- Gomal River, the tributary of the Greater Zab River, to the south-eastern corner of *Kalhu* (Nimrud). Originally, the canal seemed to have been derived from the Upper Zab itself, and water was drawn from the right bank of the river, through a short tunnel whose remains still exist in the place known by local people as "*Negoub*". It was then conducted along a cutting, first by the side of the Greater Zab, and

afterwards in a tortuous course in the undulating plain, and across the ravine formed by the *Shor-Derre* torrent (wadi). The Greater Zab when this part of the work was constructed, ran deep along its right bank and supplied water into the tunnel directly, which maintained a constant stream in the canal. But after a while the river abandoned its right bank for the opposite shore; and, water ceased to flow through the *Negoub* tunnel, so it became necessary to get the flow by some other mean.

Accordingly, the canal was extended northwards, partly by cutting and partly by tunneling, to the *Khazer- Gomal* River at about two miles above its confluence with the Greater Zab River, and a permanent supply was therefore secured from that stream. The work was intended in part to supply *Kalhu* (Nimrud) with mountain water.

From the remnants of dams and sluices along the course of the canal there is sufficient evidence that it was intended mainly for irrigation. Water was probably derived from it to irrigate the whole triangle lying south of *Nimrud* between the two rivers, a tract containing nearly thirty square miles of territory, mostly very fertile, and with careful cultivation was well capable of supporting the metropolitan city on which it abutted as illustrated by Figure (36). An *Assyrian* inscription on a slab that was found by the British Archeologist Sir Austin Henry Layard (1867) in the tunnel, at “*Negoub*” gave sufficient evidence to prove that the tunnel, and

the irrigation canal network seemed to have been improved and maintained by Sennacherib himself ⁽¹²⁾.

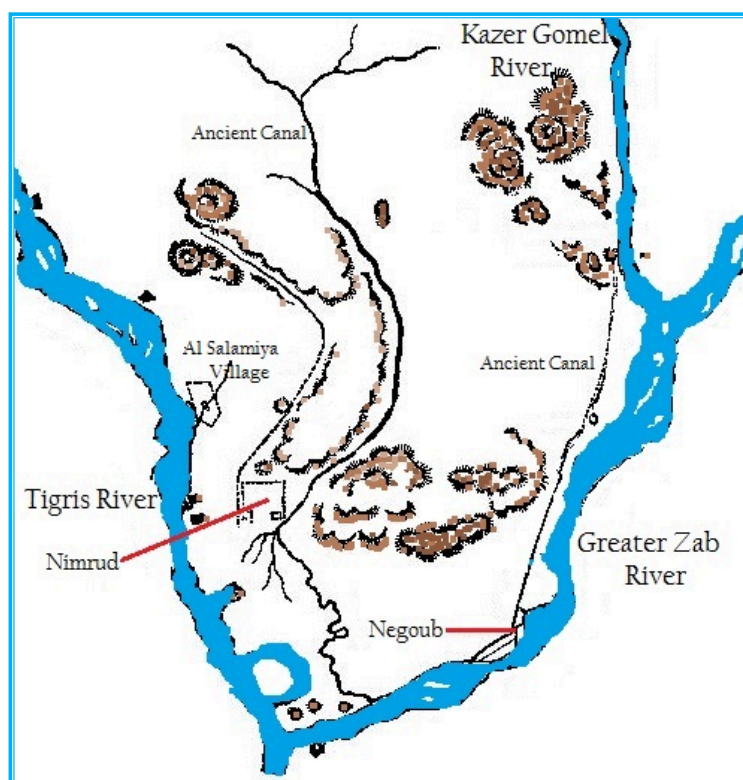


Figure 36: Sketch showing location of Kalhu “Nimrud” and ancient irrigation canals system (Modified from Layard (1867) ⁽¹²⁾.

One more important irrigation scheme that was constructed by the *Assyrian kings* was that which carried water to the ancient city Erbil (*Araba-ilu*) and to the plain around it. Human settlement at Erbil can be dated back to possibly 5000 BC, and it is considered as one of the oldest continuously inhabited cities in the world. Erbil became an integral part of the *Assyrian Kingdom* by at least the 21st century BC through to the end of the 7th century BC. For this reason Erbil itself and the area around it are rich with the remnants of the works of the previous civilizations, and especially the *Assyrian*. These may be seen in the remnants of the irrigation

projects which have marked features on the landscape of the region.

Not far from Erbil, one of the most important historical irrigation projects was discovered; the *Bastora system* attributed to *Sinnecharib* himself. The scheme utilized an excavated subterranean tunnel which formed a very long *Kariz*, and drew water supply from a place called *Bastora* to supply the Erbil area. This *Kariz* did not take its water exclusively from ground water as normal for such systems but directly from a river located to the northwest of Erbil called *Bastora River (Chai)*, and could have been supplemented by ground water along its course. The *Bastora River* originates from the Safin Mountain, Bani Bawa Dag and Salah-i-Din area, which was known to the *Assyrians* as “*Khani Mountains*”. It runs in westerly direction for about 50 kilometers and empties into the Greater Zab River at a point located south of the village called “Sharafana”; upstream from the confluence of the Khazer- Gomel River with the Greater Zab. The river normally carries good supply of water and is considered even today as a good source for irrigation water supplies.

The location of the *Bastora Karez* tunnel intake was located at about 1.1 km east of the village named “Qalat Mortik” and was at an elevation of about 50 meters above the land that the *Karez* was to irrigate. The intake site was visited by the late Fouad Saffar; a prominent and well known Iraqi Archeologist in (1946-1947), who mapped and photographed the stones of the remnant part of the

intake and documented the inscriptions he found on the stone masonry of this structure, which attested clearly that the project was attributed to *King Sinnecharib*. Safar articles on this discovery in the Iraqi journal of archeology “ *Sumer*” were the basic reference for further detailed work carried out later on by the archeology team from Harvard University in 2012 who published their report in (2017)⁽¹³⁾. This team had worked previously on *Sinnecharib Bavian* canal and the *Nineveh system* as explained already (see reference no. 11). According to Sousa (1986)⁽⁹⁾ a masonry spur was built in a skewed position against the direction of the flow in order to divert part of the river flow to the tunnel portal that was dug in the rocky escarpment at the left bank of the river. This masonry work which was 15 meters long was constructed from stones that were cut in blocks of 62 x 43 x 80 centimeters in dimensions. One of these stones had eight lines of inscriptions, which were documented and translated by Saffar, and it read the following:

“I, Sinnecharib, King of the World has dug three rivers in the Khani Mountains above the city of Erbil and added the waters of springs from the right and left sides and made the canal run to the middle of Erbil; the seat of the Great Lady God Ashtar, and made the course of it straight”. From this, we may conclude that *Sinnecharib* had constructed many canals to collect water, and that this particular Kariz had tapped many underground springs at both of its sides to make it a very complicated and extensive system.

In the survey carried out by the Harvard University team ⁽¹³⁾, the shafts of *Bastora canal* proved to be elusive. Despite the known position of the canal head, unambiguous shafts or upcast rings could not be identified in any remote sensing data sets available to the team, which otherwise displayed abundant *karez* traces elsewhere in the survey region. But ground inspection resulted in locating nine features, which could fall on the route of Bastora canal as reconstructed from the sketch map of Safar (Figure 37). The same survey also revealed the presence of a very large open irrigation canal very much similar to the *Nimrud (Kalhu)* canal, which carried water from the upper Zab to irrigate large part of the Erbil plain thirty kilometer west of Erbil itself, where over 65 km² of land could be irrigated.

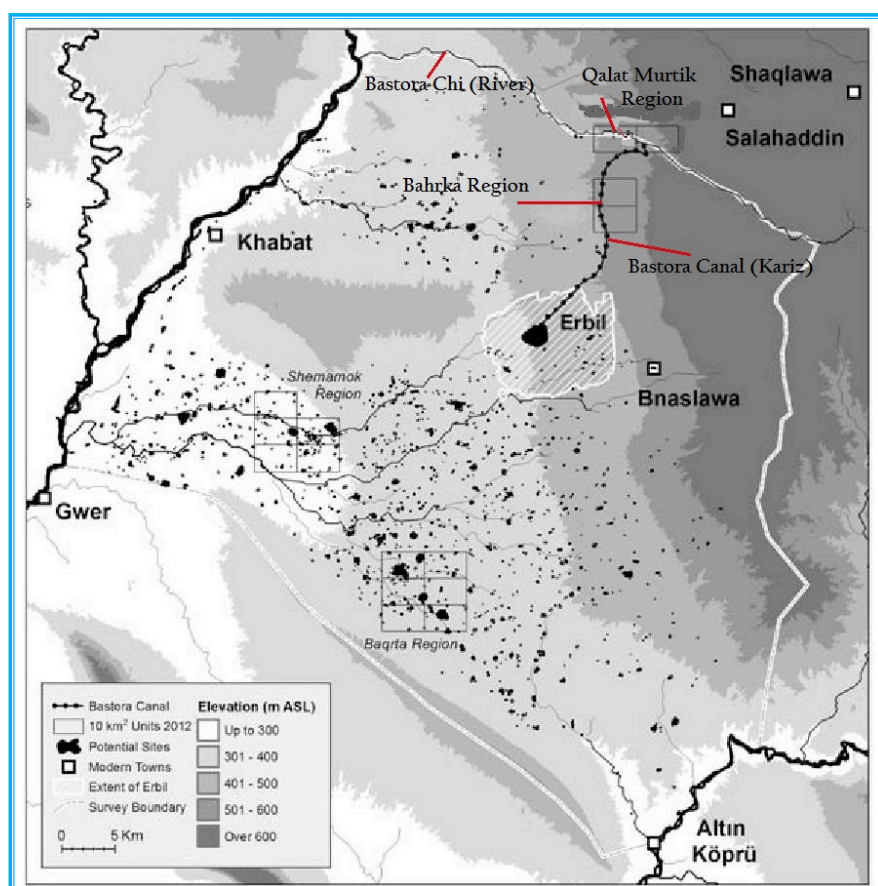


Figure 37: Map based on aerial photography showing the Bastora canal (Kariz) and other ancient irrigation features in Erbil plain (13).

In *Assyria*, a great deal of hard work was done to get irrigation water to cultivate the lands and grow their needs. *Herodotus* (484-425BC) the Greek geographer and *Strabo* (64BC- 21 AD), the Greek philosopher, wrote about this in addition to what we have received from the *Assyrians* themselves in the form of inscriptions and monuments, confirm this fact.

In the geography of *Assyria*, there was but little flat alluvial lands. The land topography was generally undulating, and most of it stood at a considerable height above the water streams. Water, therefore, was required to be raised from the level of the rivers to that of the land before it can be spread over it. The *Assyrians* had

either to go very far upstream of a river to tap water from it and bring it down in long canals making use of the difference in elevation and utilizing the sloping grade of the land, or in other cases, they used the *Kariz* subterranean conduit systems to bring water to these lands. They also sank wells were needed as their modern counterparts do today. Moreover, where they could make use of a suitable bank of convenient height over the river, they made use of the *noria* or other devices that were used by the people in *Sumeria* and *Babylonia*. With these aids, they lifted the water into a tank or reservoir, whence they could distribute it to orchards or farms. In some instances, it was necessary to carry the water over wadis and natural water courses by means of aqueducts to bring it to where it was needed. For all these works, they must have had very good knowledge of hydraulics, surveying and constructing work experience.

In producing their food, the *Assyrians*, apart from animal husbandry, which was supported by grazing of their herds of sheep and goats at the foothills and mountains of eastern *Assyria*, they grew vegetables, fruit trees and grain. According to *Herodotus*, the kinds of grain produced in *Assyria* in his time were wheat, barley, sesame, and millet. These crops still constitute at the present day the principal agricultural products of the country, and we may conclude that they were in all probabilities the chief species cultivated throughout the Empire.

Besides grain, it seems certain that the *Assyrians* cultivated the

vine. Vines grew well in many parts of *Assyria*; and the monuments left by the *Assyrians* represent vines with a great deal of truth, not merely as growing in the countries to which the *Assyrians* made their expeditions, but as cultivated along the sides of the rivers around *Nineveh*, and in the gardens belonging to the palaces of the kings. In the former case they appear to grow without any support, and are seen in orchards mixed with other fruit-trees, as pomegranates and figs. In the latter, they were trained upon tall trees resembling firs, round whose stems, they twine themselves, and from there their rich clusters droop as seen in Figure (38). Sometimes the long branches were brought to pass across from tree to tree, forming a canopy under which the Monarch and his consort sip their wine ⁽¹⁴⁾.

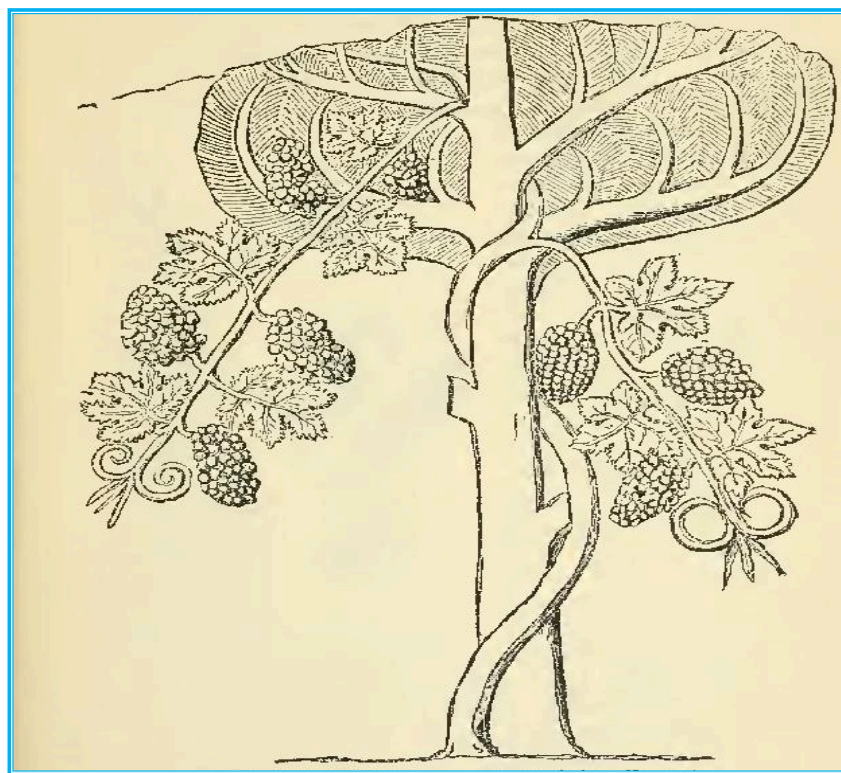


Figure 38: Assyrian representation of vine tree supported by another fruit tree, Rawlinson (1862) ⁽¹⁴⁾

The *Assyrian* kings were fond of planting the courtyards of their palace gardens and public parks with trees and greeneries, and they brought back from conquered lands such varieties of these plants which were not known to them before. In her article “Ancient Mesopotamian Gardens and the Identification of the Hanging Gardens of Babylon Resolved”, Stephanie Dalley ⁽¹⁵⁾, gave an interesting account of the *Assyrian kings’* works in this field. One interesting passage which she quoted from an inscription on a discovered monument that belonged to Tiglath-Pileser, where he boasts in his royal inscriptions, says;

“I took cedar, box-tree, and Kanish oak from the lands over which I had gained dominion- such trees as none among previous kings, my forefathers, had never planted, and I planted [them] in the orchards of my land. I took rare orchard fruit, which is not found in my land and filled the orchards of Assyria”.

Just over a century later another *Assyrian king*, *Ashurnasirpal II* boasted of his works saying;

“I dug out a canal from the Upper Zab, cutting through a mountain peak, and called it Abundance Canal. I watered the meadows of the Tigris and planted orchards with all kinds of fruit trees in the vicinity. I planted seeds and plants that I had found in the countries through which I had marched, and in the highlands which I had crossed: pines of different kinds, cypresses and junipers of different kinds, almonds, dates, ebony, rosewood, olive, oak, tamarisk, walnut, terebinth [Pistacia] and ash, fir,

pomegranate, pear, quince, fig, grapevine ... The canal-water gushes from above into the gardens; fragrance pervades the walkways; streams of water as numerous as the stars of heaven flow in the pleasure garden Like a squirrel I pick fruit in the garden of delights”.

When *Sargon II* (722-704 B.C) built an entirely new capital city, *Dur-Sharrukin*, north-east of *Nineveh*, he bought up land from local owners who were properly compensated, and had parks and orchards laid out for his royal pleasure, where he and his family could practice hunting lions, and falconry. But his keen interest in getting and planting all sorts of trees in *Dur-Sharrukin*, is shown in one letter sent to him by one of his governors which read as follows:

“I have levied upon the people of Nemad-Istar the supply of 2,350 loads of apple trees, and 450 loads of medlar trees. [The people of Suhu province] are collecting saplings of almond, quince and plum trees, and they are transporting them to Dur-Sharrukin. The people of Suhu are also bringing saplings from the land of Laqe: 1000 loads of apple trees. Their vanguard has arrived and I have seen it, but their rearguard has not yet arrived”.

Dalley tells us also that *Sennacherib* the King- Engineer had built a temple of the “New Year Festival” within a garden, outside the walls of the city *Ashur*. The temple of the “New Year Festival” may have been the place where the king, representing the god, performed the ritual marriage ceremony with a priestess. From the

uncovered root-pits, the layout of trees or bushes was discovered by a German expedition, although the type of plants could not be established. Within the central courtyard as well as outside it on all four sides, trees or shrubs were planted very neatly in regular rows. The excavators reconstructed them as bushes, but they may have been trees with slim trunks, to give the impression of a sanctuary within a grove. This single example shows us that temple courtyards, like palace courtyards, were used for gardens.

The *Assyrian Empire* reached its zenith during the final decades of the 8th century BC and first decades of the 7th century BC. But as normal for most civilizations decline always comes afterwards leading to their dissolution and collapse. The reasons for such an end may vary, but they are always attributed to a combination of many factors. In the case of the *Assyrian Empire* the weakness of management of the widely spread empire during the rule of the last few kings following *Sinnecharib*, in addition to revolts, insurrections, and political turmoil and conflicts over the throne were good reasons for its fall. Moreover, severe climatic conditions leading to food insecurity and even famines exasperated in many cases the unrest.

Ashurbanipal (668- 627 BC) the grandson of *Sinnecharib* had initially peaceful years of calm and bountiful harvests, which was ended by his brother *Samas-Summa-ukin* revolt in (652BC). Decades of instability followed which may be direct result of recurrent failures of harvest. In 657 BC an unusually severe

drought impacted badly upon the Empire agricultural base. Given that the Empire was an agrarian society, and agriculture was the most basic element of the *Assyrian economy*, this event proved to be detrimental. The Empire had already put much of its resources into perpetuating and growing of this agrarian base and had even taken the pains of moving populations into the *Assyrian Heartland* from concurred lands to have the required manpower, but only to have this base weakened and undermined later on.

Schneider ⁽¹⁶⁾ advances two hypotheses for the dramatic fall of the Assyrian Empire. First, he thinks that a major cause of this fall is rooted in the increased trend of aridity in the region, which contributed to the deterioration and undermining of the agricultural base of the Assyrian economy. Second; the explosion of the population which was brought about by the forced resettlement of people from conquered lands into the core area of the empire during the reign of *Sinnecharib*; who appears to have overseen the resettlement of more than half million people from outlying areas to the hinterland of *Nineveh*. This could have been due to political reasons or the need for cheap or even free man power to support his agricultural schemes, or may be both. The expansion of the new capital also placed additional stress upon food supply of the wider heartland region. Given the location of *Nineveh* is in the northern part of Mesopotamia, where mean annual precipitation was relatively plentiful, it is very possible that by expanding the city's agricultural area, *Sinnecharib* reduced the overall

productivity of the *Assyrian* harvest by concentrating manpower here, particularly during drier- than- average years. Moreover, because *Nineveh* was forced to obtain some of its food supply from other parts of the empire, this would have reduced the capacity of those other parts to draw upon surplus food stocks during periods of low agricultural productivity.

Another author (Soltysiak)⁽¹⁷⁾ seems to disagree completely with Schneider's hypotheses of climate change and overpopulation, and he argues that long- term climatic variation and the inter-annual variability in crops have always been very high in the dry farming areas of Upper Mesopotamia. To cope with this uncertainty, the local population developed several strategies (e.g. storage of agricultural surpluses in granaries and artificial irrigation in river valleys), and that the stable prices of slaves during this period suggest the absence of prolonged periods of food shortage. This researcher argues that based on texts belonging to *Sargon II* times suggest that the royal granaries, temple or municipal granaries were well prepared for potential drought outbreaks. Food storage was the primary insurance policy of the State.

Some other actions also decreased the risk of inter- annual weather variability. The *Assyrian* armies confiscated the granaries of cities they defeated, and the irrigation networks in the core provinces and along the Middle, and Lower Euphrates made the crops more predictable in these areas. Additional evidence of the

relation between famine and slave prices indicates that three periods from 700 to 676 and 675 to 649 and 648 to 612 showed no significant difference in the average price of slaves, otherwise a drop of such prices would have been noticed as a result of the inability to feed those slaves⁽⁷⁾.

Whether due to climate change and the occurrence of droughts or not, other factors also contributed heavily to the fall of the Assyrian Empire. *Assyria* 's outside adversaries, who had their eyes on the thriving heartland of *Assyria*, and whom had suffered at the hands of the *Assyrian* armies; the *Medes* from the east and *Babylonians* from the south, were growing in strength, and their constant harassment to the *Assyrians* had worked negatively to the empire stability. The cessation of Egypt during *Ashurbanipal* rule delt another blow and led to the rapid decline and demise of the empire. In 626 BC *Babylon* shook off the *Assyrian* yoke, defeating an *Assyrian* army. Two years afterwards, the *Assyrians* were defeated in battle with the *Babylonians* and their new allies the *Egyptians* only 300 km from Babylon itself, and in 616 BC the *Medes* under *Cyaxares* conquered also large parts of *Ashur*. In the year 612 BC, *Nineveh* fell to the combined forces of the *Babylonians* and *Medes*. *Haran*, *Ashur-uballit's* last stronghold, was already taken in 610 BC, ending the Assyrian Empire, Figure (39).



Figure 39: Map of the final stage of the Assyrian Empire

To say some final words about the *Assyrians*; they, who had inherited the civilizations of *Sumeria* and *Babylonia* surpassed their predecessors in many respects. They introduced improvements, which gave greatly increased value and almost a new character to arts and technologies previously developed. The genius of these People is best being seen when full accounts are given of their language, their arts, and their system of government. In the words of Sir George Rawlinson, the renowned British Archeologist, he puts the Assyrians as superior to all their contemporaries and especially when compared with the Egyptians. It seems fitting; therefore, to close this chapter by a quotation from his book “Five Great Monarchies of the Ancient “World” (14), in which he says:

“To appreciate the Assyrians; we should compare them with the much-lauded Egyptians, who in all important points are very

decidedly their inferiors. The spirit and progressive character of their art offer the strongest contrast to the stiff, lifeless, and unchanging conventionalism of the dwellers on the Nile. Their language and alphabet are confessedly in advance of the Egyptian. Their religion is more earnest and less degraded. In courage and military genius, their superiority is very striking; for the Egyptians are essentially unwarlike people. The one point of advantage to which Egypt may fairly lay claim is the grandeur and durability of her architecture. The Assyrian palaces, magnificent as they undoubtedly were, must yield the palm to the vast structures of Egyptian Thebes. No nation, not even Rome, has equaled Egypt in the size and solemn grandeur of its buildings. But, except in this one respect, the great African kingdom must be regarded as inferior to her Asiatic rival, which was indeed "a cedar in Lebanon, exalted above all the trees of the field, fair in greatness and in the length of his branches, so that all the trees that were in the garden of God envied him, and not one was like unto him in his beauty".

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Babylon in a New Era -The Chaldean and Achaemenid Empires (330- 612 BC)

Apart from short periods of disobedience under the *Assyrian* Empire, the *Akkadian* and *Babylonian* cities of Southern and Middle Mesopotamia lived peacefully, but they were reduced to provincial cities governed by the *Assyrian Kings* or their vassals for the whole period of the *Assyrian Empire* of almost 300 years.

The inhabitants continued to pay taxes and other dues to the central government, which were essential to maintain the upkeep of the *Assyrian* armies, support the King's campaigns, and sustain the prosperity of *Assyria*. The provincial governors or King's vassals saw to the collection of the levied taxes and dues; and especially those originating from trading and agriculture. Agriculture was therefore, of great importance and interest to those rulers, who kept an open eye on it and made sure that the irrigation systems were maintained regularly in the usual routines that were common for the previous hundreds of years. We do not expect, however, that the methods and ways of irrigation had changed much from previous practices, since these methods and ways had been brought up already to a high level of efficiency during the past times. Salinity and the salinization of land, however, remained a constant threat to the fertility of the land.

Flood protection was the other communal activity which deserved constant attention and actions; and the people continued to combat the dangers of the Tigris and Euphrates high floods. Again

such protection works remained the same as previous and we may add that the same were applied in the following years up to the days of modern Iraq. The inhabitants of Lower and Middle Mesopotamian cities continued their normal ways of life for all the time they were under the umbrella of the *Assyrian Empire*, and they were sure that no foreign invader could infringe on their territories, as long as they were there. At the same time, they were sure that any uprising if they had ever contemplated would be crushed in the brutal way that was known for the *Assyrians*.

During all this period, except for some short spells of time, *Babylon* remained a flourishing and wealthy city and competed with *Nineveh* in its beauty and grandeur. *Babylon* was considered by the *Assyrian Kings* as the sister city to *Nineveh* and even was ruled for some times directly by some of them until the fall of the *Assyrian Empire* at the hands of the *Chaldeans* and their allies leading to the rise of the *Neo- Babylonian Empire*. So in order to put the reader in the right perspective, it is worthwhile here to give a short summary of the events leading to the rise again of *Babylon* in this new era.

After the death of the great *Babylonian King Hammurabi* of the older *Babylonian* dynasty, the following Kings were weak and *Babylonia* fell in 911BC to the domination of *Assyria*. Further migration in the early 9th century BC of nomads from the Levant had occurred with the arrival of the *Chaldeans*, another nomadic tribe of the northwestern *Semitic* peoples who were mentioned in the *Assyrian* annals as the "*Kaldu*". The *Chaldeans* settled in the far southwest of

Babylonia, joining the already long extant *Aramaeans* and *Suteans*. By 850 BC the migrant *Chaldeans* were well established there, and as time passed, the *Chaldeans* began to cause unrest and troubles to the *Assyrians*. *Babylonia* briefly fell to the *Chaldeans* in 780 BC until 748 when it was subjugated and ruled again by the *Assyrian Kings'* vassals. It was not until 729 BC that the *Assyrian King* decided to rule *Babylon* directly as its King contrary to what his predecessors had done for two hundred years.

The *Assyrian King Shalmaneser V* was declared King of *Babylon* in 727 BC until his death. In 722 BC revolt was then fomented against the *Assyrian* domination by *Marduk-apla-iddina II*, a Chaldean *malka* (chieftain) with strong *Elamites'* support and managed to take the throne of *Babylon* itself between 721–710 BC. This was brought about at a time when the *Assyrian King Sargon II* (722–705 BC) was busy fighting the *Scythians* and *Cimmerians* that had attacked *Assyria's* Persian and Median vassal colonies in ancient *Persia*.

Marduk-apla-iddina II was eventually defeated and ejected by *Sargon II* and fled to his protectors in *Elam*. *Sargon II* was then declared King in *Babylon*, who then was followed by *Sennacherib* (705–681 BC) his son.

After ruling *Babylon* directly for a while, *Sennacherib* placed his son *Ashur-nadin-shumi* on the throne of *Babylon*, but the *Chaldeans* and their allies the *Medes* continued to stir trouble; a thing which led *Sennacherib* to invade and subjugate *Elam* and sack *Babylon*, laying it to waste and largely destroying the city. *Sennacherib* died in *Nineveh*

in 681 BC, and the new King, his son; *Esarhaddon* placed *Marduk-zakir-shumi II* on the throne of *Babylon*. Once more, the *Chaldeans* managed to take over the city forcing *Esarhaddon* to attack *Babylon* who then ruled it personally. At this time, he completely rebuilt the city, bringing rejuvenation and peace to the region. But, before his death, and in an effort to maintain harmony within his vast empire, he installed his eldest son *Shamash-shum-ukin* as a subject King in *Babylon*, and his youngest, the highly educated *Ashurbanipal* (669–627 BC) in the more senior position as King of *Assyria* and the overlord of *Shamash-shum-ukin*.

Despite being an *Assyrian* himself, *Shamash-shum-ukin*, after decades of subjugation to his brother revolted against him and led a powerful coalition of peoples also resentful of the Assyrian tyranny, including; *Elamites*, *Medes*, the *Babylonians*, *Chaldeans* and *Suteans* of southern Mesopotamia. In the aftermath of bitter fighting, this bloody period ended, and *Babylon* was sacked again; *Elam* was destroyed; *Shamash-shum-ukim* was killed, and the rebels were vanquished by the *Assyrian* troops who exacted savage revenge on the rebelling people, and an *Assyrian* governor named *Kandalanu* was appointed to rule *Babylonia* on behalf of the *Assyrian* King.

As the story of *Babylon* continues to unfold, we see that upon *Ashurbanipal's* death in 627 BC, his son *Ashur-etil-ilani* (627–623 BC) became the King. However, the cessation of Egypt from the empire during the last days of *Ashurbanipal* had already dealt a severe blow to the *Assyrian Empire* and led to its rapid decline and demise.

Following the death of *Ashurbanipal*, the new governor of *Babylon* was expelled by a *Babylonian Chaldean* soldier named *Nabopolassar*, who had once fought in the Assyrian army but now started a Kingdom for himself. He was recognized as King on 23 November 626, which marked the beginning of the *Neo-Babylonian* Empire. *Nabopolassar* continued fighting against *Assyria*, so that in 616 BC, he defeated an *Assyrian* force on the banks of the Euphrates, south of Harran in the west. He was forced; however, to retreat when an Egyptian army approached.

In the following year, the *Babylonian* king changed his strategy and invaded the *Assyrian* heartland, where he laid siege to *Ashur*, the religious capital of *Assyria*. The *Assyrians* were able to repel their enemy, but late in 615, the Medes, a tribal federation living in modern Iran, intervened. After the winter, they captured *Nineveh*, and although *Nabopolassar* arrived too late to help them, he signed a treaty with their King *Cyaxares*. *Berossus*, a Hellenistic-era Babylonian writer, wrote later on that the alliance was cemented by a royal wedding: the *Babylonian* crown prince *Nebuchadnezzar* married a princess named *Amytis*, the daughter of *Cyaxares*⁽¹⁾.

The fall of the *Assyrian* Empire and the vanquishing of its territories by the *Chaldeans* and their allies ushered the new *Babylonian* era, seeing the *Chaldeans* as the new masters of *Babylon* under their new King *Nabopolassar*. The new Empire became then the most powerful state of the time in the ancient world. But this new

empire, however, was short lived compared to the long timeline of Mesopotamian history in general, and the history of Babylonia itself, in particular, Figure (40).

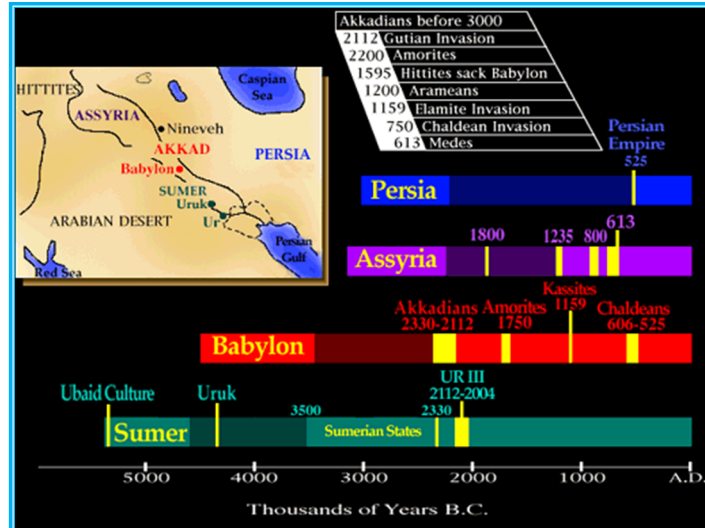


Figure 40: Babylon on the time line scale of Mesopotamia (2)

For the seventy-seven years which made the age of the *Chaldean Empire* (626- 539 BC), only six Kings had ruled. *Nabopolassar* the first King of this dynasty ruled for twenty one years (626–605 BC) and was busy securing the boundaries of the Kingdom and overtaking the remains of the *Assyrian Empire*. His son *Nebuchadnezzar II* ruled for forty three years (605–562 BC) and was the one who made *Babylon* great once again. By judging from available evidence it is very clear to historians that *Nebuchadnezzar II* was the wisest of all those Kings and the most efficient builder at home and conqueror outside, and the following growth and prosperity of the Empire were due to him; Figure (41) indicates the extent of the Chaldean Empire at his time.

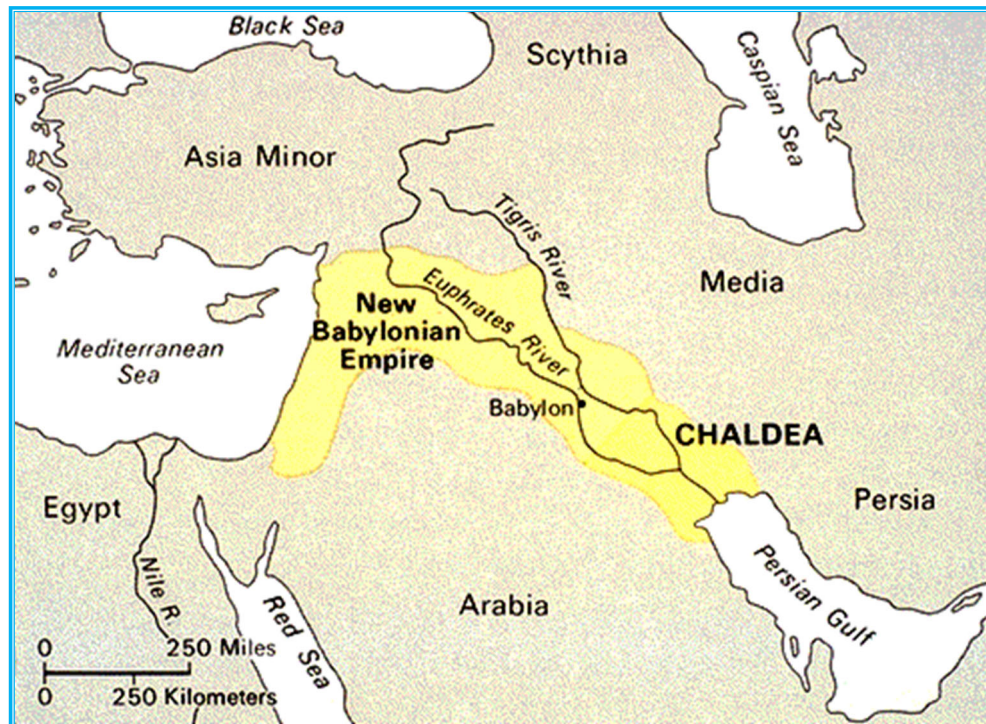


Figure 41: The Neo Babylonian (Chaldean) empire ⁽³⁾

Upon ascension to the throne of the Kingdom *Nebuchadnezzar II* was very much wary of his powerful northern neighbors, the *Medes*, although he had married the sister of *Ishtuvêgu*, King of the *Medes*, the daughter of *Cyaxares* and his father's ally to consolidate and keep this alliance alive and in order to normalize the bilateral relations between the two neighbors. He kept, however, a watchful eye on the north where the *Medes* danger could come from; and while constructing the *Hanging Gardens* to please his *Median* wife, as the story goes, he constructed great fortifications north of the town of *Sippar* further up north to eliminate any threat from them. In addition, he built the great wall, which extended all the way between the Euphrates and the Tigris Rivers, and he coupled these constructions with excavating vast networks of canals, which served the dual purpose of irrigation and defense. His care for irrigation, however,

cannot be denied for one of his important tasks was ensuring good yield of the crop, which was essentially required by the population, and he did this by maintaining the existing irrigation canals' network and constructing new ones.

In his first construction endeavors *Nebuchadnezzar II* undertook the building of fortifications to Sippar itself, which was located 60 km north of *Babylon* which he had expected to be attacked first in any invasion. Moreover, he ordered and oversaw cleaning of the canals, which were neglected by the previous Kings and were half- choked with sediments and had their sluices and dams repaired and put them in good working conditions. Finally, he turned his attention to excavate new canals, which had proven to be his greater achievements.

Nebuchadnezzar II managed during his reign to excavate four large navigable canals across the land, to unite the Tigris and Euphrates. The width and depth of each canal were enough to carry merchant ships. They were branching into networks of smaller canals and ditches for irrigating the fields, and in order to control fully the increased mass of the flow, which the canals had carried; *Nebuchadnezzar* created a huge basin or reservoir near *Sippar* on the left bank of the Euphrates by flooding a depression near the present day town called Yusifiyah. The reservoir according to the description of *Herodotus* was some thirty five miles in circumference and so many feet in depth, but other writers gave higher figures. Water was supplied to the reservoir by a very large canal which had existed

already and re-excavated by *Nebuchadnezzar* and was known as “*Nahr Malka*” or the “*Kings River*”. Stored water in the *Sippar* reservoir was then released back to the Euphrates to replenish its flow during low water seasons, and therefore, acting as the first re-regulating schemes in history. Moreover, *Nahr Malka* canal drew great deal of the Euphrates water to the Tigris River and was used as a very important navigable link between the two rivers.

The four canal networks so excavated and arranged continued to serve irrigation of the lands of the middle and lower Mesopotamia to as later time as to the end of the *Abbasid* period in the twelfth century AD. These canals and their networks are fully described in chapter 8 of this book.

Nebuchadnezzar hydraulic works were extensive and were not limited to irrigation networks only, for he provided in addition to canals excavation an elaborate and complete set of hydraulic structures to control the canals and to allow filling and emptying of *Sippar* reservoir as deemed necessary.

To complete harnessing the mighty Euphrates River, its course was slightly altered in some stretches to turn it in a sinuous line by excavating man-made meanders at some distance from one another and therefore, reduce its grade. This was meant to reduce the force of the current, which was very beneficial in high water seasons and did not only make navigation up the stream easier, but gave fuller control of the river as great part of its discharge was diverted to *Sippar* reservoir in times of floods. The importance of this reservoir was in

eliminating the dangers of spring floods and in the provision of water for use in times of drought. Similar action was taken when *Nebuchadnezzar* built his celebrated bridge across the Euphrates in *Babylon* in the dry, whereby he diverted the river and allowed his workmen to construct the mighty buttressed piers of the bridge from quarry stones clamped with iron and soldered with molten lead, and line the banks with masonry of the best kiln- burned brick ⁽⁴⁾ .

It is very clear that these four Irrigation and navigation canals and even the reservoir at *Sippar* were parts of a very efficient system of defense against any possible invasion from the north. Not only they presented obstacles, which would take time to overcome, but in case of a desperate emergency whole regions could be flooded and thus made inaccessible or untenable.

All this did not seem sufficient safeguards to satisfy the King's anxious foresight as he knew well that these alluvial lands had never offered much of an obstacle to invaders in the past, so in his determination to strengthen his defenses, he undertook the addition of a mighty wall. This wall he built across the valley, from the Euphrates to the Tigris above the location of the four canals and included within its bounds the well fortified city of *Sippar* itself. In the words of the 19th century British Engineer Sir William Willcocks, he wrote on this saying:

“As in the ancient days the fortified right bank of the Nahravn Canal, the wall of Semeramis and the Median wall protected Babylonia from surprise attacks from the Assyrians and Medians”⁽⁵⁾ .

The wall was constructed entirely of burned bricks held together by asphalt cement; and *Xenophone*, the ancient Greek writer (430–354 BC) who saw later some portions of it standing and called it the “*Median Wall*” wrote in its description:

“It was built of baked bricks laid upon bitumen. It was twenty feet broad and a hundred feet high, and the length was said to be a twenty parasange (70 English miles). It lies at no great distance from Babylon” (6).

In most of *Nebuchadnezzar* public works and construction undertakings, it is obvious that his dominant objective was to couple all these with defense requirement. Even in building his heavily fortified palaces, the great city walls, and the flood embankments of the Euphrates, these objectives were constantly pursued. Recalling that the last time when *Babylon* fell at the hands of *Sinnecharib*, and also knowing that the submission of the city was brought about because of the famine it went through when the city was put under siege, so *Nebuchadnezzar* was not contented with building great and heavily fortified wall around the city itself but went about and constructed an outer wall which was moved to such a distance as to enclose a large portion of the agricultural land to be cultivated so that the capital could raise enough grain and fodder for its own consumption. This vast space also would serve to shelter the population of the surrounding villages in case of an invasion.

The wall which was called “*Nimit-Ti- Beil*” could not be traced exactly by archaeologists later on to determine how many square

miles of agricultural lands it did protect but the reports of ancient writers on it are somewhat conflicting. *Herodotus* in his account gave the circumference of the wall as somewhat over fifty English miles, and he explained that besides the arable and pasturelands, it must have embraced suburbs, not impossibly the city of *Borsib* itself, which was also well fortified at the same time. A more modest estimate gave forty miles.

The *Nimit-Ti- Beil* according to *Herodotus* was protected on the outside by a wide and deep trench which at the same time had supplied the material for the wall. The words of *Herodotus*’ in fact, had betrayed his astonishment when he wrote:

“And how I may not omit to tell the use to which the moat dug out and the great moat was turned, nor the manner wherein the wall was wrought. As fast as they dug the moat, the soil which they got from the cutting was made into bricks in kilns. Then they set to building and began with bricking in the borders of the moat, after which they proceeded to construct the wall itself, using throughout for their cement hot bitumen, and interposing a layer of wetted reeds at every thirteenth course of bricks”⁽⁷⁾.

On *Nimit-Ti- Beil* wall *Herodotus* wrote a very detailed description in which he stated that it was 350 feet high apparently including the height of the towers, which were built at regular intervals on top of the wall, and it had a thickness of about 75 feet, which is probably overestimated. But the undisputed fact remains that the *Nimit-Ti- Beil* rampart wall was stupendous both in height and in

thickness; that towers were built on the top of it, on the edges, two facing each other, and that the remaining space between was enough for a four- horsed chariot to turn. In addition, for all this, we need not to have much imagination to realize that a wall of such height and extending for about fifty miles is an extremely tremendous job built by the sheer strength and toils of men using such tools as of that ancient times.

This outer wall, reckoned by *Herodotus* as the main defense of the city, was not the only one. A second inner wall, named “*Imgur-Beil*”, was also built by *Nebuchadnezzar*, which did not lack strength and volume. Then there were the walls enclosing the two royal palaces, the one on the right bank of the Euphrates that was built by his father *Nabopolassar* and the new one opposite to it on the left bank, which made them two fortresses.

For more convenience *Nebuchadnezzar* built in *Babylon* a great bridge on the river, but his obsession with security drove him to order the construction of the bridge deck to be of movable beams and planks so it would be possible to remove them during night and stop any crossing. In any case, this bridge was not enough for the population of the city so *Nebuchadnezzar* arranged for the constructions of riverside platforms whereby people could cross from one side to the other using boats.

Another river training works included straightening the river course within the city and lining the sides with revetments of burnt clay bricks and building two high walls alongside these banks. The

communication of people could be maintained between the two banks by leaving gates through the two walls, which open to the riverside platforms. These gates would also be closed at night.

Apart from the river training works he had carried out near *Sippar*, that were described already, it was claimed that he had diverted the river around Babylon to make possible of the construction of his great bridge piers in the dry. We take; however, the liberties to dispute this matter as any remnants of such a diversion are absent, and we may therefore advance instead of that the idea that he might have enclosed parts of the channel by cofferdams at various stages of construction to facilitate this work as we do these days in constructing any dam or a bridge in the river section.

The total length of the bridge as shown from excavations was one hundred and twenty three meters, and it had seven piers, each one having a length of twenty one meters. To fill more details on the fortifications of Babylon, which this King had completed, the excavation carried out in its ruin shed light on this. For during this excavation, many citadels were uncovered in the city wall showing a wide moat running around its outer perimeter. This was connected to the Euphrates to form the water barrier, and from it, many canals pierced the citadels' walls presumably to supply water to the population and inner city parks. Much of this information is owed to the work of the German Archaeological Expeditions which started work there in March 1899 and continued regularly until May 1912⁽⁸⁾.

In other achievements, besides irrigation and fortification, another striking work had tickled the imagination of historians, due to its supposed romantic background, and might even have led them to add more fantasy to it than truth. In many of the writings of those past historians on *Nebuchadnezzar* works, it was clear that the description of the “*Babylon Hanging Gardens*” had aroused their imaginations. Many of the Greek and Roman writers such as *Herodotus* placed these gardens among the “*Seven Wonders of the ancient world*”. Although *Flavius Josephus*, the Romano- Jewish Greek historian, who had lived in the first century AD, clearly linked the “*Hanging Gardens*” to the works of *Nebuchadnezzar*, we find a lot of confusion on this subject in the writing of many other authors. Some of them did not credit its construction to *Nebuchadnezzar* but considered that it belonged to a legendary *Assyrian* queen called *Shameram* (Semeramis). *Herodotus*, with no other historical support, had claimed that most of the other works of *Nebuchadnezzar* including this one were actually the work of Nitocris ⁽⁷⁾. Moreover, an opinion is held by one contemporary author today in which she rules out that these gardens were ever built in Babylon but in Nineva and credits it to *Sinnecharib*⁽⁹⁾.

The romantic story, which has been very commonly told about the reason of the construction of the “*Hanging Garden*”, informs us that the great King *Nebuchadnezzar* was intent on pleasing his *Median* wife *Amytis*, daughter of *Cyaxares*, the previous King of *Media*, as she longed to the breeze and sceneries of the Zagros

Mountains where she was born. So, on an artificial hill, he planted in its terraces the most beautiful trees, and on the topmost terrace, he erected a shelter for the queen where she could enjoy the purest air and the pleasant shades. The woman so loved might have felt well compensated even for the loss of the native scenery in Zagros wilds, for which her terraced Grove, some 500 feet square, could not be put an equal substitute. The grandeur of the place drove the Greeks and the Romans, as said already, to think it worthy of a place among their “Seven Wonders”, along with that of the wall of *Babylon*, the temple of *Beil*, that of *Artemis* at *Ephesus*, and a few other monuments⁽⁴⁾.

We, however, shall put all the arguments on the reality of the story aside, for the moment, and allow us the pleasure of describing this wonder while take the opportunity to contemplate on how these elevated gardens, who ever had built them, were irrigated being that high. The four terraces forming the gardens were born on arched vaults supported by pillars, all built of well cemented bricks. The pillars were sixty feet apart, and twenty two feet in circumference. On the topmost, terrace was the pump- house, with the hydraulic machinery for raising the water through pipes from the Euphrates, or rather, from a canal, which brought water within easy reach, and so that the scheme should not be noticed from the outside. Hurmuzd Rassam, in the 1850s during his excavation in the ruins of *Babylon* which was called by locals, *Mound Babel*, had come across what was believed to be the source of water to these gardens. Rassam was a native Christian from Mosul who had spent a good part of his life

digging in the ruins of *Nineveh*, and *Nimrud* in participation with British archeologists who worked in these places at the end of the nineteenth century. It is from the book on his works, we may draw this paragraph on his discovery of the “*Hanging Gardens*” and we quote his own words:

“In the Mound of Babel, which is no doubt the site of the hanging gardens, as I shall prove presently, I followed the excavations of the Arabs, who were digging for bricks, and uncovered four exquisitely-built wells of red granite in the southern center of the mound; three were situated in a parallel line within few feet of each other, and one was some distance from them in a southeasterly direction. Their engineering and scientific erection reflected great credit upon the designer. Each well is built of circular pieces of granite, which must have been brought from great distance in Northern Mesopotamia, as there is no quarry of that nature to be seen anywhere within five hundred miles up the river. Each stone, which is about three feet in height had been bored and made to fit the one below it exactly that one would imagine that the whole well was hewn in one solid rock. On digging to the bottom of these wells, it was found to communicate with an aqueduct supplied with water from the Euphrates, or a canal which must have skirted the North Eastern corner of the mound. Even when I dug into the watercourse when the river was high, the water oozed out through the debris, though the Euphrates ran then about a mile from it. These wells, which were about one hundred and forty feet higher when I uncovered them, and could not have been less than

fifty or sixty feet higher originally must have been erected exclusively for irrigating the hanging gardens, since they doubtless stood higher than any other building in the city on account of the commanding position the Mound of Babel occupied. These stones built wells are quite peculiar to that spot, because all the wells that have hitherto been discovered in Assyria and Babylon were of same style of Architecture, consisting of hard backed bricks, molded in such a shape as to fit regularly to each other”.

So, if Rassam’s theory is held to be correct then water must have been lifted by certain lifting devices, which were driven continuously by slaves to secure enough irrigation water. Rassam in support of his theory cites from the writings of *Strabo*, who was a Greek geographer, philosopher, and historian who lived in (63 BC – AD 24), and from *Quintus Curtius Rufus*, who was a Roman historian, probably of the 1st, century, that the *Hanging Gardens* were very close to the river. Moreover, *Diodorus*, a Greek historian of the first century BC, in particular, mentioned that the water was drawn by engines through conduits for irrigating the surface⁽¹⁰⁾.

In any case, the wealth and prosperity of *Babylon* would not have been possible without irrigation; a thing which was very clear to the *Babylonians* and this was even more so to all the Kings who ruled during the long history of *Babylon*. So, *Nebuchadnezzar* always saw the maintenance of the vast irrigation networks and adding new canals as first duty.

The affluence that agriculture had brought to *Babylon* fueled the progress of all sorts of crafts and the development of trade all over the region. *Babylon* became the center of exports and imports to and from all the other cities within the empire's boundaries. Again, *Herodotus* gives a vivid description of this and states:

“Of all countries that we know, there is none, which is so fruitful in grain. It makes no pretension indeed of growing the fig, the olive, the vine, or any other tree of the kind; but in grain, it is so fruitful as to yield commonly two-hundred-fold, and when the production is the greatest, even three-hundred-fold. The blade of the wheat-plant and barley-plant is often four fingers in breadth. As for the millet and the sesame, I shall not say to what height they grow, though within my own knowledge; for I am not ignorant that what I have already written concerning the fruitfulness of Babylonia must seem incredible to those who have never visited the country. The only oil they use is made from the sesame-plant ⁽⁷⁾.

During his work digging in *Babylon* ruins in 1899 for the German Oriental Institute, Koldewey, gave colorful description of the lush date palm orchards and the luxurious fields that must have stretched along the Euphrates banks during the *Babylonian* times taking parallel from those that existed during his stay. He went to say on this that after planting, palm trees would need regular irrigation only during the first year but soon after they grow of themselves, and the roots of a fully-grown tree are supposed to reach ground water. The photograph in Figure (42) was taken in 1914 by Koldewey himself of

an existing orchard on the Euphrates very close to the ruins of *Babylon*⁽⁸⁾, while Figure (43) shows an artist's impression of these orchards as visualized during the Chaldean's era⁽¹¹⁾. The agriculture of *Babylon* and the flourishing trading activities that were principally based on it were supported by a very efficient economic and commercial system, which included collection of taxes levied on the crops, duties for using the irrigation canals, in addition to the legalization of commercial transactions covering sells and purchases.

In the *Neo-Babylonian* era these activities were developed further to arranging and collecting loans and concluding contracts for agricultural purposes and other financial business and operations in addition to money transfers to beneficiaries in other towns and cities. In this matter the “*House of Éigibi*” a famous banking family of that time is worth recording.

The story of this family was revealed to the world by sheer luck when the British Archeologist George Smith came across some terra cotta jars, while suspecting their worth, he managed to buy them from a dealer in Baghdad for 70 pounds. These jars happened to contain 3000 pieces of miniature tablets, ranging in size from one square inch to twelve.



Figure (42: Palm trees grove close to Babylon's ruins (8).



Figure 43: Chaldean Palm Grove (11)

Upon examination, these tablets were found to be documents recording all sorts of transitions and bearing the names of the parties involved. These were nothing less than the archives of the “*House of Êigibi*”. From the information inscribed on these tablets it appeared that this family was entrusted with the collection of taxes levied on land, and the crops of corn, dates, etc., in addition to the dues for the use of the public roads and the irrigation canals, etc., Their activities extended beyond the city of *Babylon* to some neighboring cities and provinces. The functions of notary public were added to their other duties and included; concluding, certifying and ratifying business deals in all branches of social life and mutual relations. Their other commercial dealings covered money lending and executing loans.

The history of the family seems to have started with the founder; a certain *Êigibi* who had possessed immense wealth and influence and was probably the head of the house in the reign of *Sinnecharib* about 685BC. Professor Friedrich Delitzsch reached the conclusion that the name *Êigibi* is the equivalent to the Hebrew YAKÛB (Jacob), from which fact he inferred that the great banker must have been a Jew. Most probably this man was one of those Jews taken into captivity by *Sargon II* out from *Samaria*. It was evident that the family had reached the climax of its wealth and power under *Nebuchadnezzar*. The signatures on the tablets bore the names of his sons and grandsons showing that the activities of this house extended over many generations. Rassam in 1882 managed to dig out and add

several hundred more tablets to the three thousands bought by George Smith, which are kept now in the British Museum. Among Rassam finds there were some pieces, which dated to the reign of *Alexander the Great* in *Babylon*. This indicates that the work of the “*House of Êigibi*” had continued for nearly four hundred years which may deserve them the name of the “*Babylonian Rothschild’s*”. The family as it seems had survived the storms of the two sieges under *Sinnecharib* and *Assurbanipal*, as they were to pass safely through several more similar political crises protected by their exceptional position, which made them very useful—and necessary and not to be harmed, while at the same time Professor Friedrich Delitzsch tells us also that they were entrusted by all the financial businesses of the court ⁽⁴⁾.

The golden days of the *Babylonian* ended, when *Cyrus II*, the rising King of the *Achaemenids*, attacked and conquered *Babylon* in 539 BC. After a half century of military expansion, political accomplishments and building achievements, the successors of *Nebuchadnezzar II* were short-lived monarchs, weakened by all sorts of palace intrigues. *Amel-Marduk* (561-560 BC) reigned for only two years, before being assassinated by his brother-in-law, *Neriglissar* (559-556 BC). After *Neriglissar's* death, his young son, *Labashi-Marduk* (556 BC) reigned for barely a month before *Nabonidus* (555-539 BC) seized the throne. Although very little is known about this King, which was not from royal roots himself, some stories said he had taken up the worship of the Moon God as his religion, and

possibly because of the *Babylonian* population resentment of this the *Persian* conquest of the region seemed straightforward.

In 539 BC, *Cyrus II* entered the country and after one major battle, which was won by the *Persians* near the confluence of the Diyala and Tigris Rivers *Cyrus II* took over other cities without resistance. On October 12, 539 BC, *Babylon* fell and the native rule over the whole area was ended for many centuries. With *Babylon* which was the capital of the *Neo- Babylonian* empire, *Persia* gained the entire territory of the *Babylonian* empire and profited from *Babylonia's* earlier achievements in its unprecedented expansion⁽¹²⁾. This was one hard lesson of history, which tells, that all fortifications and wealth are of no use if corruption prevails.

The fall of *Babylon* paved the way to a new era in the history of Mesopotamia, for this was the beginning of the first *Persian Empire's* rule of this land, which was the *Achaemenid Empire* (550–330 BC). This empire was based in South Western Iran, founded by *Cyrus the Great*, and in its greatest extension covered 5.5 million square kilometers, from the Balkans to the Indus Valley, and it was reckoned at that time as the largest empire which was ever known, Figure (44).

The Achaemenids were nomadic Persians, who had lived in the southwestern part of the present day Iran at about 1000 BC and managed to establish their first small Kingdom there. This Kingdom was subjugated to the *Median Empire* for a long time. Their remote place and the preoccupation of the *Medes* in the defense of their

empire against the frequent attacks of the *Assyrians* gave the *Achaemenids* the opportunity to grow gradually in strength and influence until the rise of *Cyrus II*, (600- 530 BC) whose mother was *Mindana* the daughter of the *Median* King *Astyages*, and his father was *Kambyses I*, King of the *Achaemenid*.

Cyrus II managed at the start to ally with the last King of *Babylonia* *Nabonidus* and turned against his grandfather *Astyages*, the King of the *Medes* and defeated him in battle and then set out to incorporate the existing empires of the ancient east. *Cyrus* ordered the building of a new capital to his empire whose remains stand now near the City of *Shiraz* and called it *Pasargadae* (559–550 BC). We know that other capitals were also built by the *Achaeminds* Kings and took them as their capital cities in addition to *Pasargadae* during the history of this empire. Special interest was paid to *Babylon* by the *Persian Kings*, and it became the residence of th Royal Court in winter as one of the capitals of the empire along with *Susa*, *Persepolis* and *Ecabatana*, and its population became a mix of native *Babylonians*, *Achaemenidens*, *Egyptians*, *Western Semites*, *Medies*



Figure (44): Map of the Persian Achaemenid Empire under the reigns of Darius the great and Xerxes, (<https://www.ancient.eu/image/148/>).

and immigrants from *Asia Minor* and other parts of the empire.

These were soldiers, officials, functionaries, and traders ⁽⁸⁾. *Cyrus* utilized his tactical genius, as well as his understanding of the socio-political conditions within his territories to eventually incorporate into the empire neighboring *Lydia* and the whole *Neo-Babylonian Empire*. He was the first King in history who had attempted to govern different ethnic groups on the principle of equal rights and responsibilities, so long as the subjects paid their taxes and kept the peace. The King also did not interfere with the local customs, religions, and trades of his subject states, and so he won the support of the *Babylonians*.

The management of such a large empire brought with it the need for keeping order and control and led to large expenditure of resources and mobilization of troops to quell local rebellions⁽¹³⁾. After the death of *Cyrus II* twelve Kings ruled the empire until it crumbled at the hands of *Alexander* (The Great) in 336 BC during the reign of *Darius III* (338- 336 BC).

During the two centuries of the *Achaeminds* domination the *Babylonian* culture continued to develop. Mathematical astronomy reached a considerable new height; its successes were among the most impressive achievements of ancient civilizations, and within the same period *Babylonian* law reached its heyday. Agriculture, in particular flourished as one of the main sources of income to the empire, and it would seem that the giant irrigation systems inherited from the

previous generations were well kept and taken care of. Some changes might have happened gradually in the socio-economic relations, but the *Persian* administration in *Babylonia*, as well as the royal court, spent autumn and winter in *Babylon* and made extensive use of the local scribes' services writing in *Aramaic* and *Akkadian*.

Although the state chancelleries in *Achaemenid Babylonia* used *Aramaic*, *Akkadian* remained the language of religious cult and medical and mathematical literature as well as to a certain degree legal document. The *Achaemenid Babylon* became the cosmopolitan city of that time with such mixed population of different ethnic origins. In addition, to native *Babylonian*'s considerable number of *Iranians* (*Persians*, *Medes*, *Arians*, *Sakai*, etc.) who were royal officials and soldiers or who came to live in the country for various reasons. These *Iranians* are frequently referred to in *Babylonian* documents as contracting parties, witnesses and officials of the royal administration⁽¹⁴⁾.

Mesopotamia carried special weight and importance to the *Achaemenid Empire* and to fully understand this; it is important to look in the administrative framework of the empire on which governance was based. For the *Achaemenid Empire* was divided into twenty regions (*Satrapies*) with one governor (*Satrap*) taking care of one of each of these regions; of which we mention, for example, India, Ionia, Egypt and Mesopotamia (*Ashur and Babylonia*). All these *Satrapies* were of such importance that the *Achaemenid King* called himself among other titles King of Kings.

The geopolitical situation of *Babylonia*, however, went through some changes during the history of the *Achaemenid Empire*. For *Nabonidus*, the last *Babylonian* King, who had actually handed over *Babylon* to *Cyrus II* ⁽¹⁵⁾ continued in his post as the vassal King for the first four years after the *Persian* conquest. In 535 BC, however, *King Cyrus* merged Mesopotamia and "*Across-the-River*" (Syria) in a single province and appointed for the new *Satrapy* the *Persian* (*Gubaru*), who remained in this post until as late as 525 BC. But at the beginning of the rule of *Darius I*, grandson of *Cyrus II*, this King undertook significant reorganization of the *Satrapies*. In particular, around March 520 BC, a *Persian*, (*Ustanu*) was appointed governor of *Babylonia* and "*beyond-the-River*", and the retrieved historical documents which referred to him as *Satrap* of this province belonged to the period between 520 and 516BC.

Within this set up, the study of social life and economic conditions in Mesopotamia is necessary in order to fully understand the agricultural environment and irrigation during the *Achaemenid* period. Many scholars have concentrated their work on studying the *Babylonian* documents from that period which have shed light on these aspects indicating that some important changes in the main social institutions, political and economic life, and even in the *Babylonia* ideology had occurred during the *Achaemenid* rule as contrasted with previous times⁽¹⁶⁾.

As already mentioned previously, *King Cyrus II*, after his conquest of *Babylon*, had permitted the *Babylonian* Kingdom to

continue as a special entity keeping to itself its traditional methods of administration and social institutions⁽¹⁷⁾ and there was no immediate interruption in the normal functioning of the law and the economy, even land ownership rules and taxes remained as before. *Babylon* became the winter residence of the *Achaemenid Kings*, as one of the royal capitals like *Susa*, *Persepolis*, and *Ecbatana* and the most highly placed *Babylonian* officials retained their positions in the administrative apparatus. *Cyrus* even tried to reestablish normal conditions for the economic development of the country and for its traditional culture, and the priests were encouraged to revive their ancient cults, which had been somewhat neglected during the rule of the last *Chaldean King Nabonidus*. *Cyrus*, moreover, assumed the official title "*King of Babylon, King of the Lands*," a practice emulated by his successors until the early years of *Xerxes I* reign.

Nevertheless, the enormous *satrapy* comprising almost all the territory of the former *Neo-Babylonian* was divided after 486 BC into two parts. The list of the *satrapies* of the *Achaemenid Empire* provided by *Herodotus* indicated that *Babylonia* and the rest of *Assyria* constituted the ninth *Satrapy*, whereas the lands "beyond the River", i.e. *Syria* constituted the fifth.

Important further changes in the status of *Babylonia* occurred during the reign of *Xerxes I*, who reigned from (486- 465BC). After the *Babylonians* revolted twice, in 484 and 482 BC, *Xerxes* punished the rebels severely and ordered a considerable part of *Babylon* destroyed. The *Babylonian Kingdom*, which until that time had been

considered eminent and different from other *Satrapies*, at least in theory, was downgraded to an ordinary *Satrapy*. Subsequently, however, these reprisals did not diminish *Babylonia's* importance in the *Achaemenid Empire*. The province was geographically central; its population was large and concentrated, and it was still growing. Its economic structure was highly developed, and it was a source of immense wealth in crops, manufactured goods and cash. Even after *Xerxes'* punitive measures, *Babylon* and its environs supported the residences of the *Persian* Kings, princes, and courtiers. The city held a royal treasury and archive; in classical accounts, it ranked with Susa as an imperial capital ⁽¹⁸⁾.

The most important practical result of the *Persian* conquest of Mesopotamia was that the supreme power in the country belonged to the *Persian King* and his *Satrap*. The administrative structure of the *Achaemenid Empire* most closely resembled that of the *Neo-Assyrians*. The *Persians* almost certainly borrowed some elements of that structure through the *Medes*. In the economic aspects, *Darius I* (550–486 BC) father of *Xerxes I* had already established a new system of state taxes. This system put special emphasis on agricultural yield and land ownership. Amounts of these taxes and exemption reflect the state of agrarian relations and land ownership in Mesopotamia as well as other parts of the empire.

Before *Darius I*, under *Cyrus* and *Cambyzes*, there was still no firmly regulated system of taxes based on an accounting of the economic potentials of the various regions of the *Persian Empire*.

According to *Darius* reforms, all *Satrapies* were obliged to pay monetary state taxes in silver, the amount being determined on the basis of the area of cultivated land and its fertility as calculated in accordance with the mean perennial yield; for this purpose, the land was precisely measured and classified by crop. At the time when *Darius* introduced his reforms, the *Satrapy* of India came first in the amount of annual taxes paid to the treasury of the King. It consisted of 4680 talent of silver every year, when one talent was equivalent to 300 kilograms making more than 1460 tons, then came Mesopotamia (*Assyria and Babylonia*) with 300 tones, followed by Egypt 210 tones, *Kaleici* 110 tones, Syria and Palestine (beyond the River) 105 tons and the four small Asian *satrapies* 530 tons. The *Satrapy* of *Persia* was exempted from all taxes as a privilege of being the seat of the empire (13), (16).

All *Satrapies* were also required to pay a tribute in the kind of grain, cattle, sheep, beer, etc, which is difficult to establish in actual quantities from available documents. This was meant to support garrisons, royal and satrapy courts, and the state administration. Some documents mentioned that the *Satrapy* of Egypt had supplied grain enough for 120,000 persons, while, Media gave 100,000 sheep and Armenia gave 30,000 birds.

Documents preserved from *Babylon* showed cadastral field plans, which were usually depicted as rectangles or triangles and contained information on seed capacity, number of fruit trees, the kind of crop, the state of tillage of the land, legal status of the land and the

buildings erected on the fields. However, the purpose of these plans has never been satisfactorily explained, but they may have been the basis for estimating the amounts of taxes and tributes, which were due or, could be also used for agricultural land transactions.

These documents belonged to the third year of *Darius I's* rule, which can be dated to the year 519 BC. Having in mind that the Empire's revenue was based in a great part on the agriculture of the Crown lands, and rents of irrigation canals, in addition to tribute from the people, it is important to have some insight of the irrigation systems and agriculture lands of *Babylonia* and their contributions to this revenue. Very important information on the irrigation network and agriculture was obtained from the ancient documents of *Murašû Archive*. This is a collection of cuneiform tablets that were excavated between 1888 and 1900 from the ruins of *Nippur* in central *Babylonia*. Named after the chief member of a single family, the *Murašû Archive* was a collection of business records that had covered four generations. They are assembled during the reigns of the *Persian* Kings *Artaxerxes I*, *Darius II*, and *Artaxerxes II* and provided the most illuminating information on business activities and conditions of the *Persian*-rule of *Babylonia* during the last hundred and fifty years of the *Achaemenid* Kingship.

The *Murašû* family to whom the archive belonged had worked as one of the agents to the crown during that period, which reminds us of the *Êigibi family* in the *Chaldeans* times. The archive gave us

information on the agrarian relations and the agricultural outputs in *Babylonia* at that period.

It is a well known fact that the wealth of *Babylonia* was based primarily on agriculture and that the limiting factor of *Babylonian* farming was water in which case the major elements of irrigation networks had become the property of the *Persian* Crown. It is also good to remember that during the *Neo-Babylonian* and *Achaemenid* times, irrigation systems in large parts of *Babylonia*, including the *Nippur* region, underwent changes in structure as interlocking grids as was seen done by *Nebuchadnezzar*, composed of parallel main canals joined to each other at frequent intervals by transverse secondary canals. This reticular arrangement improved access of agricultural land to fresh water and also enhanced drainage. They supported cultivation over increasing areas, and consequently, fostered expanding revenues for the state. The scale and regularity of the canal networks indicated government sponsored development ⁽¹⁹⁾. At the same time, the canals themselves as a prime economic factor became the object of commercial manipulations in which the agents, such as *Murašû* family played prime role as revealed from their archive. Great part of the canals and reservoirs belonged to the King, and were leased to agents like the *Murašû* house, who in their turn subleased whole canals, some stretches of canals or even leased water rights to different users.

In their turn, these agents paid royalties to canal managers appointed by the crown. The canal managers, however, had to answer

to senior royal officials. Moreover, those agents had a significant role in leasing agricultural lands and even agricultural equipment to their tenants. Under the *Neo- Babylonian* dynasty, final control over the management of crown interests rested with the King himself.

When *Babylonia* became a province of the *Persian Empire*, the new rulers delegated command over royal interests in the province to surrogates, presumably men with wide competence. Canal managers remained as the direct contacts with the agents and gave them receipts for the royalties received from them. The fact that many documents covering these dealings were found in the *Murašû archive* does not rule out the existence of other agents similar to the *Murašû House*. In many cases, the agents sold water to independent farmers directly either from canals or from reservoirs. Some documents described particular cases whereby users irrigated their land and paid back with a percentage of the crop watered, and this percentage varied depending on whether it was done by direct flow or by lift irrigation.

To summarize, canal managers were officials of the crown; they controlled the use of waterways and crown properties, agricultural equipment and even field workers; they leased the holdings, they were responsible to agents who had direct contacts with the cultivators. But, without the managers' own records, the range of their agents cannot be determined ⁽¹⁸⁾. Apart from conducting business as mediatory agents for the supply of irrigation water, *Murašû House* dealt also with leasing agricultural lands and organized property transactions and ownership as other agents might have done.

Stolper in his book “*Entrepreneurs and Empire*” (18) observed from archaeological evidence that in most areas of Mesopotamia the *Neo-Babylonian* and *Achaemenid* periods mark the beginning of “*a long phase of general growth, the resettlement and cultivation of long-abandoned territory*”. He also remarked that in the fifth century BC, there was much cheap land, but water was costly, and that in *Achaemenid Babylonia* there appeared “*new installations, new techniques, and better utilization of the available water*”. He concluded that the economic history of *Babylonia* in the second part of the fifth century BC is relatively well-known owing to the *Murašû House* archive, and the activities of the *Murašû House* and other similar agents were conditioned by the changes introduced by the *Persians* into property policies in *Babylonia*.

The categories of property included the Crown holdings, allotments to *Persian* noblemen, collective of soldiers, and to officials who were not farmers themselves and turned their land over to other persons to cultivate. Agents like *Murašû House* rented these allotments and paid rent to their owners as well as the appropriate state taxes to the treasury. However, this land was usually let to sub-lessees who supplied the seeds and animals. To judge from the *Murašû House* documents, the rents that *Murašû House* paid for land were very low of about one *kur* (ISO liters) of barley per *kur* (13,500 square meters) of land or less.

Land constituted the main source of royal taxes. The *Achaemenids* took part of land from the *Babylonian* population, kept

some to the crown, and distributed the rest as large estates to members of the royal family, representatives of the *Persian* nobility and high officials. The total area of royal lands under the *Achaemenids* increased very much as compared with the preceding period. These lands were situated in the *Nippur* region (See figure 19, chapter3), as well as in the neighborhood of *Babylon*, *Sippar*, *Ur*, *Dilbat*, and other Mesopotamian cities. These and other lands belonging to members of the royal family usually were put out for leasing.

In a specific case a representative of the *Murašû* firm rented royal fields along the banks of several canals near *Nippur* for a term of three years. The *Murašû* house undertook to pay an annual rent of 220 *kur* (39,600 liters) of barley, 20 *kur* (3,600 liters) of wheat, 10 *kur* (1,800 liters) of spelt which was one of the earliest forms of wheat used for livestock feed and as a grain for human consumption. One document showed that in 507 BC two tenants had paid nine *kur* (1,600 liters) of dates as annual rent for some land that was royal property.

This payment was made through the superintendent of the royal dates. The next year payment was made to the same superintended and consisted of thirty-six *kur* (6,480 liters) of dates. This land was located, in all probability, in a suburb of the city of *Isin*; the King also owned here many large canals, which his managers leased out for high prices. In the neighborhood of *Nippur*, the royal canals were rented by the *Murašû* house who, in their turn, leased them to groups of small landowners. Thus, in 439 B.C. seven landowners in the

Nippur area signed a contract with three lessees of various parts of the King's canal, among whom was the *Murašû House*. According to these contracts, the landowners could irrigate their fields during three days of each month from "*the water of the canal, the royal property*". They were to pay one-third of the harvest and dates in addition a certain sum of silver for each unit area of land. Other types of land possessed by the King were those called the "*uzbarw of the King*".

The exact meaning of this very old Persian word is not known, but it could designate vineyards. It is understood that all categories of royal lands were exempt from taxes. The redistribution of land affected by the *Achaemenids* resulted also in the appearance of different types of land ownerships belonging to royal soldiers, artisans, etc. These ownerships were also allotted from state land. It seems that there was some difference between the royal land in the narrowest sense and state land. However, state land, at least nominally, was at the disposal of the King. In the period preceding the *Persian* conquest of *Babylonia*, the royal economy did not occupy a large share of the economy of the country. Though the *Achaemenid Kings* possessed a large amount of land in *Babylonia*, the royal economy did not play the leading role in the country. This role belonged to the private and temple households ⁽¹⁶⁾.

Finally, it may be said that the *Persian* administration in the *Achaeminds* period was not interested in the internal intellectual life of *Babylonia*. The achievements of *Babylonian* mathematical astronomy, whose most creative period began in the last quarter of the

fifth century B.C, and the changes in *Babylonian* religious thought were due to the development of the native tradition. The *Persians* were only concerned with creating a stable state administration, establishing a new system for collecting royal taxes, and increasing the recruitment of troops. Significant changes did occur in the administrative system of the country, and many public institutions gradually fell under Iranian influence. Although *Babylonian* private law changed little, many Iranians became involved in local business life. Moreover, documents from *Babylon*, *Nippur* and some other Mesopotamian cities refer to judges of *Persian* origin.

Radical changes occurred also in the system of agrarian relations. Land taken from the indigenous population was distributed in large tracts as hereditary property to members of the royal family and to *Persian* nobility. Some land was in the direct possession of the King, and all these estates were exempt from taxes.

The system of military service also changed whereby the redistribution of land had created different types of ownerships belonging to royal soldiers and state's workmen. These ownerships were granted from the state land by the royal administration and carried an obligation of military service or state courtier's and administrative service. But in all this, irrigation canal networks, reservoirs and water rights remained the sole property of the King. No mention of maintenance works to these systems is available to us. Judging from the extent of wealth of *Babylonia*, which stemmed in great portion of it, from irrigated agriculture, it may be concluded that

the canal managers most probably kept these systems in good order. They may have contracted the works to general contractors like the *Muraşû House* in addition to the use of state resources of slaves and equipment. All this lead us to think of the canal manager as similar to irrigation departments of the modern times.

As in the case of the *Chaldean Empire*, the *Achaemenid Empire* was distained to fall as the result from weakness of the last Kings and palace intrigues. King *Artaxerxes III* came to the throne by bloody means, ensuring his place upon the throne by the assassination of eight of his half-brothers.

In 338 BC *Artaxerxes III* died in unclear circumstances, while at the same time Philip of *Macedon* united the Greeks and began to plan an invasion into the *Persian Empire*. *Artaxerxes III* was succeeded by *Artaxerxes IV Arses*. Before he could establish his power, Bagoas, a prominent official serving as the vizier (Chief Minister) of the *Achaemenid Empire*, poisoned him. Until his death in 336 BC., *Bagoas* is further said to have killed not only all *Arses*' children, but many of the other princes of the royal family. He then placed on the throne *Darius III* (336-330 BC), a nephew of *Artaxerxes IV* and previously the *Satrap* of Armenia, but later on *Darius* personally forced *Bagoas* to swallow poison. In 334 BC, when *Darius* was just succeeding in subduing Egypt *Alexander*, son of *Philip*, (*Alexander III of Macedon*) and his battle-hardened troops began their advance towards the east in *Asia Minor*.

In Asia Minor, Alexander defeated the *Persian* armies at *Granicus* (334 BC), then at *Issus* (333 BC) and lastly at *Gaugamela* (331 BC) and then he marched to *Susa* and *Persepolis*, in the heartland of the *Achaemenids Empire*, which surrendered to him in early 330 BC. From *Persepolis*, Alexander headed north to *Pasargadae*, which marked the final fall of *the Achaemenid Empire*.

As far as *Babylonia* was concerned, *Alexander* was welcomed into *Babylon*, the old capital of the ancient near east, on 22 October 331 BC when he was on his way to *Susa*. The longest description of this historic march is that of the Roman author *Quintus Curtius Rufus*⁽²⁰⁾, who based his account on earlier Greek sources. Despite having succeeded to subjugate the whole of the *Persian Empire* under his rule, *Alexander*, was nonetheless, unable to offer a stable alternative. After his early death, *Alexander's* the once massive *Persian Empire* was broken into few smaller empires ruled by his generals and their descendants. The most significant of which was the *Seleucid Empire*. Mesopotamia was destined to enter into a new phase of its history, but this is another story to be told.

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The Greeks and the Sassanids- A new glorious era for Agriculture (330- 625 AD)

A new era for Mesopotamia and the near east was inaugurated at the rise of *Alexander the Great (Alexander III of Macedon)*. Following the steps of his father Philip by uniting all Greek cities and quelling dissidents, he then directed his attention towards the east where the *Persians* posed a major threat to Greece. He led 35,000 soldiers across the *Hellespont* into Anatolia, Figure (45). In a battle at Granicus River (334 BC), he managed to destroy the *Persian* army sent to meet him by *Darius III* the king of *Persia*. *Alexander* continued his charge instead of waiting for the *Persians* to make the next move and a huge army of between 50,000 and 75,000 men, which was led by *Darius III* himself was ready to meet him in *Issus*.

The battle was fierce and swift, and to avoid capture *Darius* fled followed by his panicked army. This victory gave *Alexander* control over Anatolia, and that was in 333 BC. From there he left to conquer the coastal towns of *Phoenicia* to secure his back from the threats of the *Persian* fleets. He laid siege on *Tyre*, entered it in 332 BC, and moved to *Gaza*, which was taken after three unsuccessful assaults on its fortress. In a swift move, he marched into *Egypt* where the Egyptians, who hated the *Persians*, welcomed him as their king, placed him on the throne of the Pharaohs, giving him the crown of Upper and Lower Egypt.

Upon his return from Egypt *Alexander* focused then his attention towards the east, where the heartland of the *Persian Empire* was. He crossed the Euphrates and then the Tigris at upper Mesopotamia and marched forwards to where *Darius* was waiting for him again with a great army at *Gaugamela*. The two armies fought a bitter battle marking *Alexander's* victory in October (331 BC). The battle of *Gaugamela* also known as the *Battle of Arbela* was fought actually at about 75 kilometres north-west of *Erbil* close to the city of Duhok in the present day Iraqi Kurdistan. *Erbil* itself was a flourishing town since the *Assyrian* era which was mentioned in chapter (4) in connection with the *Sinnecharib* Kariz irrigation project. This victory marked the transfer of Mesopotamia from the *Persian* to the *Greek* hands. In his following march *Alexander* made his way to *Babylon* taking the Royal Road, passing through inhabited region rich in supplies. The Roman historians *Quintus Curtus Rufus* (mid-1st century AD), in his book translated and printed in 1809 described the countryside along the trail to *Babylon* by the following:

“His road lay over levels. The pasturage between the Tigris and the Euphrates is represented as so rich and luxuriant, that the inhabitants restrain the cattle feeding, lest they should die by a surfeit. The cause of this fertility is the humidity circulated through the soil by subterranean streams, replenished from the two rivers” (1), (2).

Babylon, renowned and ancient city, strongly fortified was embellished by the preceding dynasties that ruled from it. It was the

capital of the *Satrapy of Babylonia* even since *Cyrus the Great*. It was also one of the Great Kings' palaces sites. Lying at the heart of a region made arable by irrigation, *Babylon* was a very wealthy city, as were its religious shrines. It was run like great estates by administrations drawn from local artisans and owned mostly by the king and the nobility. Instead of resistance, the *Satrap Mazaes* rode out with his sons to meet *Alexander*, escorted by the city's civic and religious leaders. This move and the presentation of rich gifts were clearly a token of submission ⁽³⁾.

Staying for a short period in *Babylon*, *Alexander* left after leaving a military force under Macedonian command and reinstating *Mazaes* as the *Satrap of Babylonia*. His new destination was *Susa* at the heart of *Persia*, which surrendered to him in early 330 BC. Finally, *Persepolis* and *Pasargadae* fell while *Darius* was at *Ecbatana*. Learning of the *Alexander's* approaching army he retreated to *Bactria* where he was murdered on July 330 BC by *Ochus*; an officer of his own guards, who was in turn crucified by *Alexander*.

Even with the death of *Darius* the empire did not, strictly speaking, end. *Alexander* reigned in Iran as *Artaxerxes V*, and adopted Persian ways and customs and religion, although he was never Zoroastrian. The ambitious *Alexander* continued his drive and invaded India in 326 BC, winning an important victory over the *Pauravas*, in the present Punjab region in the northwestern part of the Indian subcontinent, at the battle of the *Hydaspes*. He eventually turned back to *Babylon* and arrived there in April 323BC at the

demand of his homesick troops. The Map in Figure (45) shows the route of *Alexander's* progress, which marked the extent of the Hellenic advance in Asia.



Figure 45: Alexander the great route of his military conquests

In his administration, *Alexander* was very shrewd. He adapted the local habits and religions of the regions he conquered and even showed himself as a *Persian* king in his clothing and actions and got married to the most beautiful *Roxana*. She was the daughter of a *Bactrian* chief *Oxyartes* who was taken captive with his family during the assault on *Sodigana* at *Alexander's* advance in *Persia* in his 328 BC campaign ⁽⁴⁾. Moreover, *Alexander* did not change the *Persian* laws current at the time, nor altered the administrative system of the agricultural lands or ownership and tenure, and he knew well that the most important source of *Babylonian* wealth was irrigated agriculture. Although he did not live long enough in *Babylon* which he had planned to make as his capital, he actually had grand plans for the city and for the surroundings. The first public work *Alexander the Great*

undertook in *Babylon* was the excavation of a new head reach canal on solid ground for the *Pallacopas*.

The canal known as *Pallacopas*, originally *Pallukkatu* was in existence at least by the 6th century B.C. as attested by cuneiform documentation. It served as a mean of preventing the agricultural lands along the river Euphrates and the city of Babylon on its banks from becoming flooded when the river rose in the spring.

Early travelers to this region made the first mention of the remnants of this canal in their writings, which appeared during the 16th and 17th century. This “rediscovery” is attributed to the famous Danish explorer/mathematician Carsten Niebuhr who was the sole survivor of the Danish expedition to the Near East of 1761.

In 1765, when passing through Iraq, he noticed what seemed to be the remnants of a large canal lying west of the Euphrates, named *Dsjarri Zâade*. He assumed the canal ran from Hit, on the Middle Euphrates, to the *Persian Gulf*, but this view was not unanimously accepted. Thus, the 1799 map by Dean Vincent showed the canal under the name of *Sa'deh* running from the lower Euphrates rather than from Hit, and indicated the ‘*Pallacopas of Nieb.*’ originating below Hillah (and thus below Babylon), which was a clear alteration of the original image.

During the following years, a lot of discussion and arguments raged on the actual location and the course of this canal. Numerous examples of this can be noted throughout the 19th century writings. For instance, J. W Winchester, the doctor on the famous Euphrates

expedition, which would bring steamboat navigation to the Euphrates and the Tigris, noticed a large canal leaving the river some 36 miles north of Babylon. He suggested that this was probably the head of the *Pallacopas*, regardless of the fact that, as he was travelling on the river, he never actually observed more than this head reach ⁽⁵⁾. James Macdonald Kinneir, who wrote his *Geographie Memoir on the Persian Empire* in 1813, wrote on the nature and the location of the *Pallacopas*, which he claimed to contain water from the Euphrates to Najaf. It's dry bed between Najaf, and the Persian Gulf would also still have been visible. The *Pallacopas*, he stated, was abandoned after the desertion of *Kufa* during the middle ages, only to be cleared out and reopened in the late 1700s. He obviously believed that the western Euphrates branch was the same as the *Pallacopas*, yet he did not mention this branch by name, rather opting to state speculation as fact ⁽⁶⁾.

A similar case is presented in James Baillie Fraser's account of travels in the Middle East in 1834. He states that the lands between Najaf and Basrah are a vast marsh, due to the destruction of the banks of the *Pallacopas*. The remark may go back to an actual bursting of the banks of the Euphrates and subsequent flooding of the lands along the Hindiya branch and along the lower Euphrates in the late 18th and/or early 19th centuries ⁽⁷⁾. Certainly not the entire region between Najaf and Basrah was a swamp; but rather there were individual spots of marshland ⁽⁸⁾. The fact remains, however, that the first public work of *Alexander* was to rectify the head reach of this

canal, a sign that the head of the canal was very close to *Babylon* where he had stayed.

The problem that faced *Alexander* with respect to this canal that he wanted to solve, was concerning its head reach, which had hitherto been in sandy soil. This branch was normally dammed and kept closed in the low water seasons, but had to be opened in high floods to escape the excess waters of the Euphrates and then immediately to close it again, so that after the flood the full discharge would flow in the main stream passing *Babylon* keeping the stream full.

This closing operation was a work of extraordinary difficulty, entailing the presence of 10,000 men. What *Alexander* did was to excavate a new intake at a further up location in firmer ground, which could make the opening and closing operation much easier.

In the words of the famous British irrigation, engineer Sir William Willcocks (1917):

“Next to building a masonry barrage, solving this problem was the wisest thing he (Alexander) could have done”.

Willcocks also added that, immediately after controlling the head waters of the *Pallacopas*, *Alexander* moved down the river and constructed a massive dyke between *Babylon* branch and the Najef marshes, north of Shanafiya. He did this as a preliminary work for the reclamation of this extensive area; and the dyke can be followed today and its alignment admired ⁽⁹⁾.

To make one point clear to the reader, we may add that the *Pallacopas* is the Euphrates River branch known now as “*Shatt al-Hindiya*”

Strabo the Greek geographer, philosopher and historian (63 BC-24AD) gave further lengthy details on the state of hydraulic works at his time and of *Alexander* works in Mesopotamia. He implied indirectly the hard work required to open and close the mouth of the *Pallacopas* without mentioning it by name, and for other similar canals in Mesopotamia, for he stated the following:

“He also paid careful attention to the canals; for the Euphrates rises to flood-tide at the beginning of summer, beginning first to rise in the spring when the snows in Armenia melt; so that of necessity it forms lakes and deluges the ploughed lands, unless the excess of the stream, or the surface water, is distributed by means of trenches and canals, as is the case with the Nile in Egypt. Now this is the origin of the canals; but there is need of much labour to keep them up, for the soil is so deep and soft and yielding that it is easily swept out by the streams, and the plains are laid bare, and the canals are easily filled, and their mouths choked, by the silt; and thus it results again that the overflow of the waters, emptying into the plains near the sea, forms lakes and marshes and reed-beds, which last supply reeds from which all kinds of reed-vessels are woven. Some of these vessels, when smeared all over with asphalt, can hold water, whereas the others are used in their bare state. They also make reed-sails”.

Then *Strabo* went on to say:

“Now it is impossible, perhaps, altogether to prevent overflows of this kind, but it is the part of good rulers to afford all possible aid. The aid required is this: to prevent most of the overflowing by means of dams, and to prevent the filling up affected by the silt, on the contrary, by keeping the canals cleared and the mouths opened up, Now the clearing of the canals is easy, but the building of dams requires the work of many hands; for, since the earth readily gives in and is soft, it does not support the silt that is brought upon it, but yields to the silt, and draws it on, along with itself, and makes the mouth hard to dam. Indeed, there is also a need of quick work in order to close the canals quickly and to prevent all the water from emptying out of them. For when they are dry up in the summer, they dry up the river too; and when the river is lowered it cannot supply the sluices with water at the time needed, since the water is needed most in summer, when the country is fiery hot, and scorched; and it makes no difference, whether the crops are submerged by the abundance of water, or are destroyed by thirst for water. At the same time, also, the voyages inland, with their many advantages, were always being thwarted by the two above-mentioned causes, and it was impossible to correct the trouble unless the mouths of the canals were quickly opened up and quickly closed, and unless the canals were regulated so that the water in them neither was excessive nor failed”⁽¹⁰⁾.

In another place, Strabo quoted Aristobulus of Cassandreia (375–301 BC), a Greek historian, who accompanied Alexander the Great in

his campaigns, and served throughout as an architect and military engineer as well as a close friend of *Alexander*:

In describing the abundant crop yield in *Babylonia* at that time, *Strabo* went on:

“The country produces larger crops of barley than any other country (bearing three hundredfold, they say), and its other needs are supplied by the palm tree; for, this tree yields bread, wine, vinegar, honey, and meal; and all kinds of woven articles are supplied by that tree; and the bronze-smiths use the stones of the fruit instead of charcoal; and when soaked in water these stones are used as food for oxen and sheep which are being fattened. There is said to be a Persian song wherein are enumerated three hundred and sixty uses of the palm tree; and, as for oil, the people use mostly that of sesame, but this plant is rare in all other places”⁽¹⁰⁾.

While *Alexander* was back at *Babylon*, he embarked on a plan for invading *Arabia* from both land and sea. He dispatched orders to the *Phoenician* ports, directing that a very large fleet should be built; and that the ships should then be taken to pieces, and conveyed across to *Thapsakus* on the *Euphrates*, whence they would be reassembled and sail down to *Babylon*. At that place, he directed the construction of other ships from the numerous cypress trees around as well as the formation of an enormous harbor in the river at *Babylon*, adequate to the accommodation 1000 ships of war. *Mikkalus*, a *Greek* of *Kalsomines*, was sent to *Phoenicia* with 500 talents, to enlist; or to purchase seamen for the crews. It was calculated that these

preparations (probably under the superintendence of *Nearchus*) would be completed by the spring, for which period contingents were summoned to *Babylon* for the expedition against *Arabia* ⁽⁴⁾.

Alexander, however, did not live long enough to accomplish all his projects, and he died in mid-June 331BC, after developing fever. Historians are divided on the reason of his premature death. While some of them think, he was poisoned, others believe that he contracted typhoid or malaria during his tour of the marshes of *Mesopotamia* to find the best water route to the Gulf in preparation for invading *Arabia* from the sea ⁽¹¹⁾. His wife *Roxana* survived him.

Soon after *Alexander*'s death conflict over choosing his successor broke out between his top generals. A temporary arrangement in which *Arrhidaeus*, *Alexander*'s half-brother, who was 34 years old but suffered from epilepsy and was considered feeble minded, was made king and sharing power with *Alexander*'s son (*Alexander IV*). *Perdiccas* was appointed as *Chiliarch* (basically Prime Minister) and the provinces of the empire were divided and handed out to *Macedonian* generals and loyal *Persians*.

Antipater was named as regent and *Craterus* was named as *Guardian* of the king. *Eumenes*, *Alexander*'s secretary, was given the province of Cappadocia to govern. This arrangement lasted for almost two years until 320 BC, when the generals realized that *Perdiccas* was going to set himself up as sole ruler of the empire. This led to a series of battles, which started in May 320 BC and continued over the

next two decades and finished by the division of *Alexander Empire* into five empires or kingdoms, Figure (46).

Persia, Mesopotamia and *Anatolia* passed to *Alexander's* general *Seleucus I Nicator* (the Victor), who founded the *Seleucid Empire* (648-312BC) and who succeeded in extending it also to cover the whole region of the Fertile Crescent. Various Iranian *satrapies* (vassal kingdoms) such as *Aria, Parthia, Fars, Media, Atropatene*, etc., paid taxes to the *Seleucids* but ruled with a great deal of independence.



Figure 46: Alexander's Empire after its division

Seleucus I Nicator inaugurated his reign by building a new capital for his rule, which was, *Seleucia-on-Tigris* on the western bank of the Tigris, 60 kilometers northeast of *Babylon* at the site of an older town *Opis*, not far from the confluence of Tigris and Diyala. This city was situated on the so-called *Royal Road*, which connected *Susa* with the *Assyrian* heartland and later on the *Lydian* capital

Sardes. Ancient texts claim that the city even after it had fallen in the *Parthian* hands in 141 BC remained as a flourishing city of six hundred thousand inhabitants of *Babylonians*, *Greeks* and *Jews*. A senate of three hundred elders governed it while it still had its customs run by the *Greeks*.

In 117 AD, *Seleucia* was burned down by the *Roman* Emperor *Trajan* during his conquest of Mesopotamia, but the following year it was ceded back to the *Parthians* by *Trajan's* successor *Hadrian*, then was rebuilt in the *Parthian* style. It was completely destroyed by the *Roman* general *Avidius Cassius* in 165 AD.

The function of the *Seleucid Empire* in history was to give to the Near East that economic protection and order which *Persia* had provided before *Alexander*. The valleys of the Tigris and the Euphrates, the Jordan, the Orontes, the Maeander, the Halys, and the Oxus, were fertile then beyond the conception of present imagination.

In this period as it was in the preceding times the land was irrigated by a system of canals maintained under the supervision of the state. The king, the nobles, the temples or private individuals owned the land; in all cases, serfs transmitted with the land in bequest or sale or inheritance performed the labor.

Trade was based on agriculture and manufactured goods, and commerce was flourishing. Money transactions now almost completely replaced the barter system that had survived for such a long time in past history. Bankers provided public and private credit; ships were made larger and faster, which shortened voyages by

crossing the open sea. On land, the *Seleucids* developed and extended the great highways left as part of *Persia's* legacy to the east. Caravan routes converged from inner Asia upon *Seleucia*, and opened out thence to *Damascus*, *Berytus* (Beirut), and *Antioch*. It was for control of the last two routes that the *Seleucid* and *Ptolemaic* dynasties fought the six "Syrian Wars", which continued intermittently over the period (274-168 BC). These wars finally weakened them both to the point of falling vassals to Rome. The prime and most important basis of all this prosperity remained, however, depended on the agricultural infrastructure, which was kept in good working order by continuous maintenance.

All great empires as a fact from history carry the seeds of their decline the minute they are born. After the death of *Seleucus I Nicator*, things became bad for his successors, and during the successive reigns of *Antiochos I*, *Antiochos II*, *Seleucus II* and *Seleucus III* whose death marked the end of the *Seleucid Empire* as a great power, the empire was troubled by the rebellions of *Bithynia*, *Pergamum*, *Bactria* and *Parthia*, together with the indecisive Syrian wars against the *Ptolemies*. Internal struggles began during this time, which continued until the empire's end. The *Seleucids* also had to fight the *Galatians* who devastated Anatolia, and also against rebellious elements at all levels. *Seleucids* collided with the *Romans* during the reign of *Antiochos III* in (190 BC) not without disastrous results, but the final blow which ended this empire was delivered by the invasion of the *Armenian King Tigranes II* in (83 BC). Even if

after *Tigranes*, if some rulers of Syria claimed to be *Seleucid* kings, they were no more than Roman vassals. The influence and marks of the *Seleucids* culture on Mesopotamia were clearly traced all over *Babylonia* and *Assyria*, from Seleucia-on-Tigris to other Mesopotamian cities, and archeological excavations uncovered remains from the *Seleucid's* period in *Uruk (Warka)*, *Ur*, *Nippur*, and *Babylon*, in addition to *Nineveh* and *Nimrod* ⁽¹²⁾. The end of the *Seleucid* Empire in Mesopotamia led the way to the second Persian occupation of this land.

Mesopotamia, as may be observed from its long history, remained always during these times at the middle of conflicts between empires dominating it and new rising tribal forces seeking to ascertain their identities and achieve their aspirations for independence and forming their own kingdoms and empires.

This was the case with the *Parthians*, another People from the *Persian* heartland, who had rebelled against the *Seleucids* and succeeded in forming their own empire.

Giving a brief history of the rise and fall of this empire may be justified on the ground of its long domination of Mesopotamia which lasted for almost five hundred years and the changes it brought to this land.

The *Parthian Empire*, (247 BC- 224 AD), which is also called in some references as the *Arasacid Empire*, became a major political and cultural power in ancient *Persia* and Mesopotamia. This took place after *Arsaces I* of *Parthia*, who as the leader of the *Parni* tribe,

had established the kingdom in the mid-third century BC after he had conquered the region of *Parthia* in *Persia's* northeast which was then a *satrapy* (province) of the *Seleucian Empire*.

In the following years, it was *Mithridates I of Parthia* (171–138 BC) who formed the empire by seizing *Media* and Mesopotamia from the *Seleucids*. At its height, the *Parthian Empire* stretched from the northern reaches of the Euphrates, in what is now central-eastern Turkey, to eastern Iran, and the empire being located on the Silk Road trade route between the *Roman Empire* in the Mediterranean basin and the *Han Empire* of China, became the center of trade and commerce. The rulers bore the title of "King of Kings"; as they had accepted many local kings as vassals within the empire. The royal court, however, did appoint a small number of *satraps*, largely for provinces outside Iran, but these *satrapies* were small and not so powerful.

With the expansion of the *Parthians* Empire, they moved their capital to *Ctesiphon* on the eastern bank of the Tigris River opposite to *Seleucia-on-Tigris* in 58 BC, which remained the capital until it passed to the hands of the next *Persian* dynasty; the *Sassanids*. In its expansion towards the west, the empire came into conflict with the kingdom of *Armenia*, and eventually with the late Roman Republic whereby in the battles of *Carrhae* in 53 BC, and in (40–39 BC the *Parthian* forces captured the whole of the *Levant* except *Tyre* from the Romans. But the following years were years of recurrent wars with the Romans, who had invaded Mesopotamia many times during

these wars. The Romans captured the cities of *Seleucia* and *Ctesiphon* on multiple occasions during these conflicts, but were never able to hold on to them. Frequent civil wars between *Parthian* contenders to the throne proved more dangerous to the empire's stability than a foreign invasions, and *Parthian* power evaporated when *Ardashir I*, ruler of *Estakhr* in *Fars*, revolted against the *Parthians* and killed their last ruler *Artabanus V*, in 224 AD. *Ardashir* established the *Sassanid Empire* (AD224- 651), which ruled *Persia* and much of the near east until the Muslim conquests of the 7th century AD.

The *Parthian Empire* enjoyed central location between China and the near east and controlled the road between *Mesopotamia*, *Persia's* lowland and *Transoxiana*, which is known in the Arabic sources as (*Mã Warã an-Nahr*) corresponding with modern day Uzbekistan, Tajikistan and southwest Kazakhstan.

Trade had played an important role in the economy of the empire and at the same time traditional economic activities in *Mesopotamia* during this period continued to be based on agriculture and trading with the abundant agricultural products. So, irrigation continued to have an important role in shaping the lives of most of the population and in generating exuberant revenue to the treasury and remained as major source of income to the empire.

As in most of all the times of the previous empires, the *Parthians* continued watching over the irrigation networks, which they had inherited in *Mesopotamia* and in the southwestern lowlands of *Persia*. Economic prosperity within the *Parthian Empire* was directly related

to the upkeep of the irrigation systems and agricultural practices. *Mesopotamia and the Persian lowlands* were the traditional centers of growing wheat, barley, and other cereals, while dates and other fruits were regularly produced and often exported in large quantities. In the highlands of northeastern part of Mesopotamia and the *Persian* plateau pastoralism and other forms of animal husbandry formed a major part of the agrarian activities and rain fed irrigation was practised in growing various types of grain, most importantly wheat; and growing fruits was also common. An earlier presence of rice in west Asia, especially Mesopotamia might have led to the same in eastern *Persia* and *Transoxania*.

The vast *Parthian* territories, much like the earlier and later empires of the region, were homes to people following many different lifestyles. Mesopotamia and the western sections of the *Persian Plateau* had been centers of settled population and agricultural civilizations which continued in the same way as before, while the traditionally nomadic northeast held on to its pastoral lifestyle. In *Elam* and *Mesopotamia*, human life was concentrated around agricultural villages in irrigated plains, often dotted with large urban centers such as *Babylon* and *Susa*. These areas were the most densely populated parts of the empire and were economically most productive, both in agriculture and commerce; the latter concentrated in towns and cities. Agriculture was made possible by complicated irrigation canals that watered the fertile but water-poor soil. In the highlands, mostly in the central *Persian Plateau* and northeast

Mesopotamia, the poor soil farming was supplemented by a well-organized cattle breeding and occasional nomadic pastoral production.

The highland farming yielded more fruits and some grain production, but its major agricultural contribution was in form of animal products of all sorts which often distinguished it in commerce as well. Sheep, Cows, goats and water buffalos yielded dairy products not to mention also meat, wool and leather.

Guaranteeing of water supply, particularly in the agriculturally active Mesopotamia, was among the most important functions of successful empires in this part of the world. From the *Sumerian* times, the success or failure of every empire in Mesopotamia was closely tied to its ability to control the water flow of Tigris and Euphrates Rivers, and their tributaries.

This was also the case under the *Parthian* rule. Maintenance of already existing canals and digging of new ones was central occupation for the *Parthian Empire* in Mesopotamia, but in the central valleys of the *Persian Plateau*, northeastern part of Mesopotamia and in *Transoxiana*, the *Kariz* underground systems were used and maintained for the water supply of agriculture and personal use. The maintenance of these systems required more manpower than the Mesopotamian irrigation canals and was thus another important task of the *Parthian Empire*, often hinting on the strength or weakness of the government in certain periods of its history. It was also often the case that in times of chaos and destabilization, the

maintenance of both the *Kariz* and the irrigation canals were neglected, causing further problems by weakening agriculture and thus the economy and causing further destabilization.

Land tenure during the *Parthian* period did not differ much from the *Babylonian* or the *Achaemenids* times. Generally, there were the rich landlords and the less affluent or the poor population. Owners with large land holdings, usually members of the nobility and the Royal Court controlled most of the productive land in the empire; and, therefore, families having such vast land areas would provide the basis of the later decentralized system under the *Parthians*. Small land-owners consisted of village chiefs and petty farmers. These village chiefs usually wielded much local power and often acted as agents of the nobility in managing their lands as well. Land was thus rented to the peasants who were entitled to the products of their labor and had to pay rent for the use of the agricultural land. Local chiefs were also responsible for the collection of taxes, which were often paid in kind. Another class of land-owning gentry, called the *Azatan*, also existed who were entitled to royal property in exchange for military service.

The *Azatan* cavalry formed the central core of the *Parthian* army and was mainly responsible for the *Parthian* success in external wars and in the quick initial expansion of the empire. The Empire was however, not very centralized, and as it may be imagined there were several languages, several peoples and several administrations, but the loose ties between the different parts were the key not to its survival

only but finally to its collapse also. In the history of the empire, more precisely in the second century AD, the most important capital *Ctesiphon* was captured not less than three times by the *Romans* (in 116, 165 and 198 AD), but the empire survived because there were other centers where the empire could hold on. On the other hand, the fact that the empire was a mere conglomerate of kingdoms, provinces, and city-states could at times seriously weaken the *Parthian* state as a whole. This explains why the *Parthian* expansion came to an end after the conquest of Mesopotamia and *Persia*.

The end of the loosely organized *Parthian Empire* came when its last king was defeated by one of his vassals named Ardeshir, son of the priest *Papak*, who claimed descent from the legendary hero *Sassan* and had become the *Parthian* governor in the *Achaemenid* home province of *Persis* (*Fars*). In (224 AD) he overthrew the last *Parthian* king (*Vologases V*) and established the *Sassanid* dynasty, which was to last more than 400 years ⁽¹³⁾.

The *Sassanians* in their turn established an empire roughly within the frontiers achieved previously by the *Achaemenids*, Figure (47), with the capital at *Ctesiphon*, and they consciously sought to resuscitate the *Persian* traditions and to obliterate the *Greek* cultural influence. Considerable centralization, ambitious urban planning, agricultural development, and technological improvements characterized their rule.

Sassanians rulers adopted the title of *Shahanshah* (king of kings), as sovereigns over numerous petty rulers, known as *Shahrdars*.

Historians believe that society was divided into four classes: the priests, warriors, secretaries, and commoners. The royal princes, petty rulers, great property owners, and priests together constituted a privileged stratum, and the social system appears to have been fairly rigid and the *Sassanians* who inherited the economic conditions left by the *Parthians*, were quick to forge an economic state so powerful and distinctive that its fame spread well beyond their political frontiers and their period. The economy was fundamentally conditioned by two sets of factors: natural elements and human intervention. Among the former were climate, topography, water streams, fertility of the soil, richness of the subsoil, and availability of water and among the latter were the activities of peasants, administrators, priests, nobles, and rulers, as well as the impact of foreign relations.

The *Sassanian Empire* has often been considered as a centralized state, but as far as the economy was concerned, state control remained at the beginnings relatively circumscribed. Royals were comfortable with running their own lands while most of the economic activities were in the hands of private citizens. The government at these early times was more concerned with the collection of taxes, levies, and customs duties from these activities, but the revenues from part of its territories remained outside its control, in particular, the large estates in the hands of powerful nobles. This could not be tolerated by later kings, and it must have been the reason which led to a new policy of centralization that culminated in the administrative reorganization by

Kavadh I who reigned intermittently between (488- 496 AD) and (498- 531 AD) and *Khosaru I* (531-579 AD) before successfully bringing the entire country under direct control ⁽¹⁴⁾. During *Sassanian* period, Mesopotamia reached the climax of its development throughout its whole history so far. According to (Adams (1965) ⁽¹⁵⁾, this was a direct result from the centralized policy of governance, which was supported by military successes on the frontiers against *Byzantium* and showed itself in centralized planning. This was also strengthened by the desire to reform the fiscal bases of the empire.

Clear relationship can be traced in this period between the economic situation and successes in the agricultural fields which was due to changes in the agricultural land ownership and taxation of agricultural lands and crops.

The king mainly owned the land, the nobility, and the kings tended to build new royal cities and extend royal ownership of land and agricultural districts around them, which were hitherto indirectly taxed or escaped taxation. One example of this was *Ardashir I* (224-240 AD) who put all the newly won territories under his direct rule and established new cities in his name.

The first step that *Ardashir I* had taken in his reform policy was to carry out an extensive survey and measurement of cultivated lands and registering them for the purpose of better tax collection. Taxes that were levied previously on urban land holdings that were under direct royal control were extended under his rule to all other holdings, then a specialized system of taxation was applied to the lands

according to the crop type raised and the productivity of these lands. Examples of the tax rates applied some rates may be cited; lands growing wheat and barley were taxed at a rate of one dirham per jarib (0.1592 hectar), for rice, it was a five- sixth of a dirham, seven dirham for lucerne or clover, and eighth for grapevines. Six olive trees or ordinary palms were also taxed one dirham. Actions to increase profitability such as tax rates schedules favored the expansion of summer cultivation or shift to crops with a greater unit value. Later on during the reign of *Kubadh I* near the end of 5th century AD this taxation system was extended and tax rates were applied on the area of the cultivated land regardless of its fertility or state of cultivation resulting in a tremendous increase of revenue so that it amounted then to one hundred million dirhams per year.

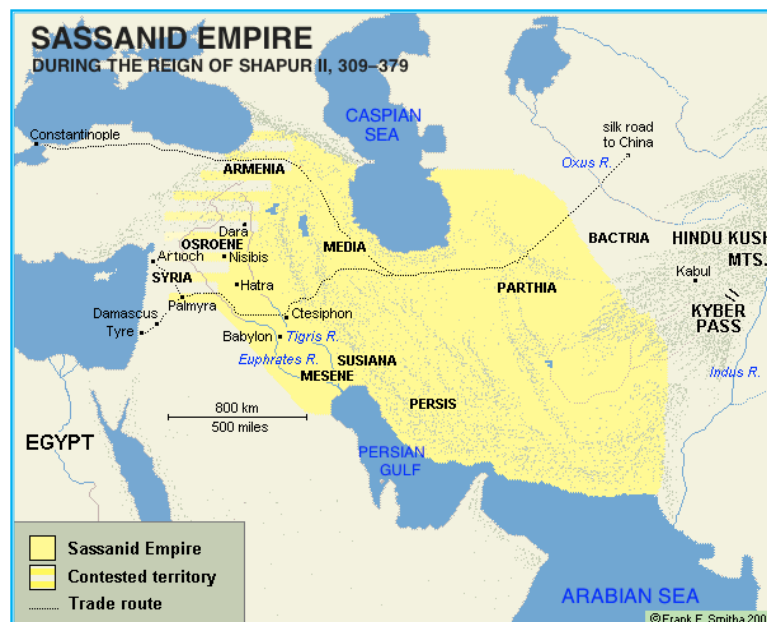


Figure 47: The Sassanian Empire during the reign of Shapur II (309- 379)

After *Kubadh I*, as his son *Khusraw I Anushirwan*, took the throne, the whole empire, including Mesopotamia flourished as a

direct result of his reform policies and to the prevalence of security and rule of law, and tax revenue during his time reached two hundred and seventy million dirhams ⁽¹⁶⁾. The surplus money thus collected made it possible to embark on extensive construction and renovation of irrigation works especially in Mesopotamia and the low lands of south west *Persia* (Khuzestan). The capital investment spent on the agricultural development which included local investment and labor, was mainly devoted to the irrigation systems, improved field canalization and drainage.

A great deal of information on the agriculture in Mesopotamia during the *Sassanians* period could be derived from the collection of writings of the Jewish rabbies who participated in the compilation of the *Babylonian Talmud*. They had described the life of the Jewish communities and settlements in *Babylonia* on the transverse canals connecting the Euphrates with the Tigris during the third and fourth centuries when the *Sassanians Empire* was at its greatest times ⁽¹⁵⁾ and so revealing much of the general condition surrounding them.

According this information, it appears that wheat was the staple crop, at least in wealthy families' homes. Following in order were barley, spelt, rye, oats, rice and millet. Pulses were also considered important, and following them in order was the cultivation of all sorts of vines, dates, sesame, flax, vegetables. Animal husbandry included breeding and fattening sheep, cows and oxen, chickens, ducks and geese. Cultivation practices, which were described, included fallow irrigation and crop rotation, intercropping of grain and vines, and

cross plowing by oxen. Irrigation canals were spread everywhere, and lift irrigation was used on many of these canals where it was needed. Manuring of fields was wide spread, usually by arrangement between a land owner and a herd owner covering the maintenance of a flock in a particular field, and perhaps because of the extensiveness of this practice, fields were fenced.

Apart from keeping the canal network in good working conditions by repair works and cleaning them from silt, many of the *Sassanian* kings constructed new canals. We are told that *Khusraw I Anushirwan* (531- 579 AD) or *Khusraw the Just* as some historians like to call him had excavated a new canal named (*Al- Katul*). It branched from the eastern side of the Tigris upstream of *Sammara* and poured into *al-Nahrawn* canal supplementing its flow and making it possible to cultivate all the land located above the town of *Nahrawn* and extended to the eastern bank of the Tigris. Construction of many other canals in Mesopotamia was also attributed to *Khusraw*, including one canal close to *Ctesiphon*, which was called the *Din* canal (16).

In spite of all the successes that the Sassanids had achieved, there were also periods of failures and weaknesses, which had hit public works, including irrigation systems and flood protection works. Mesopotamia, as well as other parts of the empire suffered from neglect and lack of attention and maintenance in such periods resulting in some irreversible changes. An account of such changes was reported by the Arab geographer and historian (*Al- Baladhuri*)

who lived during the *Islamic era* following the Sassanid period and reported one of the most important historical events, which changed the geography of lower Mesopotamia and led to the formation of the ‘*Great Swamp*’ called in Arabic ‘*Al Batayih*’. This swamp did not exist on such large scale before during the *Sassanid* period, but it grew in area to this extent after the occurrence of a flood event in the reign of the *Sassanid* king *khusraw II Parwiz* (The Victor) (590-628AD). This ‘*Great Swamp*’ covered at the time of (*Al Baladhuri*) an area of 50 miles across and 200 miles in length, and came down to the neighborhood of Basrah. It got its constant supply of water from the Tigris River some 60 miles below Wasit close to present day city of Kut in addition to irrigation channels, which ended in it.

In his description of this event (*Al Baladhuri*) reported the following:

“during the reign of Kubadh I, the Sassanian king who reigned near the end of 5th century AD, the dykes existing along the Tigris channel, as it then ran, having been for many years neglected, waters suddenly rose, and pouring through a number of breaches flooded all the low-lying lands to the south and southwest but finally the breaches were closed with difficulty. During the reign of Khusraw I Anushirwan (531- 579), son of Kubadh, the dykes were partially repaired and the lands brought back to cultivate; but under Khusraw Parwiz, the contemporary of the prophet Muhammad, and in about the year 7 or 8 after the Flight (Hejra) (629 AD) the Euphrates and the Tigris rose again simultaneously, and in such a flood as had never

happened before. Both rivers burst their dykes in innumerable places, and finally laid all the surrounding country under water”.

A-l Baladhuri then adds:

“King Parwiz himself, when too late, superintended the re-setting of the dykes, sparing neither treasure nor men’s lives; indeed, he crucified in one day forty dyke-men, at a certain breach, and yet was unable to master the flood. The waters could in no possible way get back, and the swamps thus formed became permanent; for during the succeeding years of anarchy the Sassanian monarchy perished, the dykes, such as still existed, naturally remained uncared for, and breaches came in all the embankments, as no one none gave heed, and the Dihkans (namely the Persian nobles, who were the landlords) were less to repair the dykes, so that the swamps continued to be lengthened and widen”.

Another historian (*Ibn Rustah*) of the 9th century described one more aspect of this flood event reporting how subsequently under the late *Sassanians* the Tigris River changed its course as it had done so many times during history, but this time the Tigris River beyond *Madharaya* (village known now as Kut Al-Amarah) abandoned its eastern course and shifted to the western channel (Shatt al Hayy which is known today as (Shatt Al Garaf). This change in the river course had turned the country bordering the older eastern course into a desert, and so it remained in the 9th century.

After the event of the floods so described by *Al-Baladuri* and *Ibn Rustah*, the lower Tigris remained in its western course in all the

centuries during the *Abbasid Khilafa* and poured into swamps down the western channel past Wasit ⁽¹⁷⁾, and the Great Swamp took its permanent present extent as it is today. But to add to the reader knowledge, it was on this branch that the city of Wasit was built later on after the Islamic conquest of Iraq. Sometime in the fifteen century, however, the Tigris River went back to its original course and Wasit was deserted.

The canalization systems during the *Sassanian* times which were inherited later by the State of the *Abbasid Khilafa* was vividly described in a book by *LeStrange*, who wrote it basing his account on the writings of Muslim authors of the *Abbasid* period and he could state the following:

“The existence of the Great Swamp and the consequent change in the courses of both Euphrates and Tigris is the chief matter of note in the physical conditions of lower Mesopotamia during the Khilafa; but of almost equal importance, was the system of canalization inherited by the Arabs when, after the conquest, they took over the country from the Persians. Briefly, as already stated, find that “Irak” north of the swamp, and between the two rivers, was then traversed, like the bars of a gridiron, by a succession of canals, which drained eastward into the Tigris; while east of the Tigris a canal, 200 miles in length, called Nahrawn, starting from below of Tikrit and re-entering the river fifty miles north of Wasit. This effected the irrigation of the lands on the further or Persian side of the Tigris” ⁽¹⁷⁾.

In another testimony given by the British Engineer Sir William Willcocks, who studied the conditions of irrigation in Iraq at the beginning of the twentieth century, he said:

“Perhaps the greatest prosperity witnessed by the delta of Iraq was in the days of the Sassanian Persians in the first Christian era. At this time, Al Nahrawn canal, which was four hundred feet in width and fifteen feet in depth, irrigated the whole area east of the Tigris River, and the Dujail River (Canal) irrigated the entire region west of the river. As for the four canals mentioned by Xenophon, which flowed out of the Euphrates, and the other canals which derived their water from the Babylonian branch near to Babylon, they all irrigated the area that extended to the old Tigris river course or the Hay River (Present day AlGaraf River). It was Amyan Merklan, who visited Iraq in the fifth century after Christ, who described to us the conditions of this region, and reported that it was a forest of greeneries, which extended all the way from one end to the other”⁽⁹⁾.

The Sasanian provinces of Iraq and *Khuzestan* in the low land of southwest *Persia* were among the first regions to be conquered by the Muslim Arabs, and they were major agricultural zones, which the *Sassanians* had paid exceptional attention to, and invested heavily in making them agricultural heavens with high productivity rates that could be taxed efficiently. Both *Khuzestan* along with Iraq were the breadbaskets of the *Sasanian Empire*, and they were the most important regions to every empire that ruled those two regions. The two regions were the scene of great imperial contributions and

enormous agricultural investments during *the Sasanian* times. *Khuzestan* was the second most vital province of *Ērānšahr (Iran)*, after *Āsōristān* or Iraq and its conquest by the Muslims was a huge blow to the *Sassanians* ⁽¹⁸⁾.

All of these accounts testify to the great extent of irrigation systems in Mesopotamia during the *Sassanian* times, but it should be kept in mind that these works mostly had passed to the *Sassanians* as a heritage from the previous empires which in more than one case date back to *Babylon*.

In all fairness, it must be mentioned, however, that the *Sassanians* spared no effort in developing these systems and keeping them in good working conditions. Water and water works were always central themes of the *Sassanian Kings* works. This fact is clearly reflected, not only in actual works by themselves, but also shown in the *Sassanian* water law, which was current in those days.

One of the most important surviving legal sources from the *Sasanian* period is ‘*The Book of a Thousand Judgments: a Sasanian Law Book*’, which is a compilation of legal cases composed during the reign of *Khusraw I* and derived its legitimacy from the *Zoroastrian Avesta*.

Beyond religious interpretations, this *Law Book* revealed the high level of centralization achieved by the time of *Khusraw I*. The sophisticated and thorough treatment of legal rights reflected Sasanian irrigation management practices and as an example, one of the chapters was on a particular legal case regarding water rights during

the *Sasanian* era, which had transpired in Mesopotamia, and it revolved on partner's sharing of irrigation water sources.

Indeed, due to the large presence of the *Sassanians* in Mesopotamia, scholars can follow the *Sasanian* law from the *Babylonian Talmud*, which is a central rabbinic text, second only to the *Torah* in the Jewish faith since the *Babylonian Talmud* was compiled by Jews living in Mesopotamia during the course of *Sasanian* rule from the 3rd to the 5th centuries. In this way, therefore, the *Talmud* recounts many legal and even cultural aspects of the *Sasanian* Empire ⁽¹⁹⁾.

Dr. Yaakov Elman in his analysis of the *Sasanian* irrigation law and management from the ancient Mesopotamian rabbinic text argues that the *Persian's* hunger for arable land was due to the aridity of the Iranian plateau; in addition, the *Babylonians* hunger for increased agriculture productivity was due to the overpopulation of Mesopotamia.

In this way, the *Sassanians* sought to maintain tight control over Mesopotamia to ensure an influx of surplus food into the arid Iranian plateau. Increased agricultural wealth in Mesopotamia also allowed for higher taxes to be collected by the *Sassanians* from this wealthy region. This had also provided support for agricultural growth, which included the construction of irrigation projects and maximizing the irrigation potential of the Euphrates and Tigris rivers. Elman notes that the *Zoroastrian* religion highly encouraged agriculture, and argues that the *Sasanian* dynasty's nearly constant war campaigns led

to increased demands for agricultural productivity from areas such as Mesopotamia during times of warfare. Furthermore, based on the legal indications of water rights, Elman confirms that *Sasanian* society was highly feudalistic and even capitalist in nature. Towards the end of the dynasty, *Sasanian* kings encouraged wealthy families to invest in irrigation works. In fact, during the *Sasanian* era, canal building was a profitable business (20).

One more reason for the *Sassanian* dynasty kings to be so highly interested in water works was the place that water had occupied in *Zoroastrianism*. Many of the most famous *Sasanian* rock reliefs depict the water goddess *Anahita* investing the kings with holy legitimacy or “grace”.

The goddess *Anahita* existed in Persia before the creation of *Zoroastrianism*, and in fact, it was only with the *Achaemenid* king, *Artaxerxes II* (404-358 BC) that *Anahita* became incorporated into this faith. *Artaxerxes* commissioned the spread of images and temples dedicated to *Anahita* throughout his empire.

The area of modern day *Armenia* became a center for the *Anahita* cult and *Armenia* was the birthplace of the *qanāt* or *karez* system, the ancient irrigation technology that to this day nourishes arid soils throughout the expanse of the former *Persian Empires*. We may say therefore, that water was integral, both spiritually and materially to ancient *Persians* and this was another driving element in water works development in *the Sassanian* period.

The *Sassanian Empire* continued to rule vast territories of the of old world for more than 400 years. It occupied some of the wealthiest regions of those days which included the prosperous Mesopotamia, the rich agricultural lands of southwest Persia and other extensive fertile lands in the east and north while irrigation canal networks in these regions continued to function well and produce every possible sort of crop in abundance.

The *qanāt* or *karez* systems were constructed in a most extensive fashion all over *Persia* where topography was suitable and this development was brought about by the sanctification of water by *Zoroastrianism*.

Apart from all this, the Empire had full control over the trade routes between east and west, which had added to its wealth and strength. The *Sassanian Empire* also had the might, vigor and the military strength, which allowed it to expand and defend its borders, and also to crush all uprisings and dissidents within it and keep the unity of its land. However, when any empire ages, it is like any other living organism; signs of weakness and decay that were dormant in the past start to appear and gradually work to overcome it and become reasons of its fall.

The fall of the *Sassanian Empire* was an outcome of the gradual disintegration of the socio-political regime that had held the empire together. As we have seen the empire was formed by an alliance between the *Persian* house of *Sassan* and the *Parthian* noble families. The latter being great feudal families who owned many large

agricultural estates in the empire and provided at the same time the bulk of military manpower for the *Sassanian* armies, especially the heavy cavalry which was the backbone of the army.

This type of feudal regime allowed the nobility to have great influence on the Crown and the affairs of the State, while the socio-political reality was a good ground for corruption, court intrigue, and tyranny; as it was based on exchanging benefits between the two sides. This system gave power to the Crown, and gave at the same time fertile land, wealth and influence to the nobility. In such a situation, it was only expected that when a king would clash with the nobility, he was usually removed with not less than some chaos and upheaval. Only powerful monarch like *Khosrow I* was able to have a relatively free hand in running the affairs of the empire.

According to the new administrative reforms *Khosrow* introduced, the *Parthian* noble families were shuffled around in line with the newly introduced administrative division of the empire into four quadrants ruled by four generals; this caused disorganizing all the arrangements made by those noble families in running their vast agricultural lands and estates, and it was a very unpopular measure. It meant that one family found its agricultural lands under the rule of members from other families. In addition, *Khusrow's* reforms greatly interfered with the economic and military management of the *Parthian* realms; which hitherto were mostly private and untouched by central authority. The *Parthians* never forgot that *Khosrow I* had disrupted the 'natural order of things, so they showed their discontent

and worked against his successors leaving the empire in disorder and anarchy.

We may also conclude that the question of the agricultural recourses' ownership and administration was one of the main reasons leading to the downfall of the empire. This situation in the empire was coupled with many recurrent wars along the empires borders as the *Sassanian Persians* and *Eastern Roman* empires waged wars with each other, on and off between (602 AD) and (628 AD). Though each had marginal triumphs, neither managed to conclusively destroy or subjugate the other. The general idea conveyed in most works of history, is that the cost of this long war left both empires practically helpless in a face of an unexpected and mutual enemy which was the early *Islamic Arabs*.

By the middle of the seventh century, the Muslims had devoured *Sassanian Persia*, and had reduced the *Roman Empire* to a fragment of its former self.

When the Arabs first attacked the *Sassanian Empire* in (628 AD), it was shortly after the end of the *Roman-Persian* war during the reign of the child King *Ardashir III* (628- 629 AD), when the *Persian-Parthian* confederacy was disintegrating and at a time the empire was consumed by chaos and division. The military effort against the invading Muslim Arabs lacked determination, coherence, consistency, and strength.

Many military encounters between the *Sassanians* and the *Muslims* were fought during the reigns of *Ardashir III* and the short

reign of the usurper *Shahrabaraz* (27 April to 17 June 629 AD). All of these battles ended in *Persian* defeat. The first reign of *king Borandokht* (17 June 629 to 16 June 630 AD) followed in which three more battles were fought and also lost by the *Persians*. The first and last *Persian* victory against the Arabs was won in the Battle of the Bridge (Al- Jisr) during *Borandokht* second reign (631- 632 AD) but the *Persian* could not take advantage of this victory to pursue the Arabs and destroy them. So the next battle of *Qadisiyah* in (635 AD) left the empire completely disorganized where the *Persian* army was nearly decimated, and the *Persian* leader *Rostam* was killed.

The last blow that finished the empire came in the battle *Nehavand* in (642 AD) during the reign of *Yazdgerd III* (631- 651 AD) the last king of the *Sassanian* dynasty, who himself was killed in *Marv* in (652) by people who realized that the *Sassanian* dynasty was already a thing of the past.

Therefore, the last chapter on the history of once a very powerful and prosperous empire was closed to usher a new era which has continued to have its influence all over the world; namely the era of the new religion of Islam.

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Part II

Al- Sawad

“Muslim Scholars”

The first Century of Islam And The Question of Land and its Cultivation (636- 750 AD)

At the beginning of the seventh century AD., Mesopotamia witnessed a profound change, for this time represented a pivotal point in history, not only for Mesopotamia, but for the whole region. This period witnessed the rise of a new religion, which stood on equal footings with the two other monotheistic religions, namely Christianity and Judaism; that is Islam. The spirit and zeal of the followers of this new religion resulted in changing the way of life, values, and traditions of many Peoples, not only in the region, but in a much wider sphere of influence.

At the zenith of the Islamic Empire, its boundaries extended from the Atlantic Ocean in the west, to the Sind river valley in the east, and from *Transoxania* the middle of Asia in the northeast, down to the Indian Ocean in the south, and the Sahara in the southeast. Islam dominated even the Iberian Peninsula in southern Europe for some 400 years. Both the *Sassanid* and *Roman Empires* suffered bitter defeats at the hands of Muslim Arabs who pushed forcefully from the Arabian Desert at the onset of this period. The expansion outside the Arabian desert boundaries was motivated by; first, spreading the new religion and converting more people to it, and second, to establish the temporal rule of Islam and lay hand on the riches and treasures of these Empires.

The Arabs of Mecca had previously come in contact with Mesopotamia and Syria in the pre-Islamic era through trade. The rich Quraysh clan of Mecca, to which the Prophet Mohammad belonged, used to have their merchant caravans visiting Mesopotamia and Syria twice a year to trade. This active trading with the two empires necessitated forging agreements with both empires for the passage and safe return of these caravans, at times when the two empires were at rift over the trade roads. The long wars between them reflected on both of them and left them tired and weak, a fact that was taken in well and was made advantage of by the invading Muslims^{(1), (2)}. So at the time of their expansion, the Muslim Arabs knew what great prize was waiting for them there.

The Arabs had known Syria, which belonged to the *Byzantine Empire*, by the name *Bilad Al Sham*, and knew well *Mesopotamia*, which belonged to the *Sassanid Empire*, by the name of Iraq. While Mesopotamia was the name given to this land by the Greek and Roman historians, the actual name used by the Arabs was Iraq. The origin of this name, however, is believed by many historians to have come from the word (*Uruk*) which means (Settlement) in the Sumerian language, and refers also to the Sumerian City State (*Warka*)⁽³⁾.

It was a well known fact, thousands of years before the Muslim conquest that, the lands of Greater Mesopotamia, if properly irrigated and managed, could attain a productivity which could not be found anywhere else in the Islamic world. Estates in the alluvial lands

between the two rivers and the riverine areas of the Euphrates valley areas could be extremely profitable for those who owned them, supporting a gracious and cultivated life in palaces and cities. Rough calculations based on early *Abbasid* revenue lists suggest that the alluvial lands of southern Iraq had generated four times more tax revenue as the next richest area of the Islamic world which was Egypt, and five times as much as all Syria and Palestine combined. This intensive agriculture was almost entirely dependent on artificial irrigation ⁽⁴⁾.

The Muslim Arabs, however, after their conquest of Iraq, called this land, the land of *al-Sawad* “*Ardh Al Sawad*” or shortly “*Al-Sawad*” meaning the dark land. The dark green color of the thick palm gardens stretching all over the horizon, gave the illusion of darkness. This indicated also the great fertility and large extension of the cultivated land. *Al- Sawad* covered all the land that was conquered by Muslims at the time of the second *Khalifah* ‘Umar ibn al- *Khattab*. Geographically, *Al- Sawad* extended from *Hulwan* on *Hulwan River* (Al Wand River) close to the old town (*Qasr- Shirin*) in the present day Iran, to just above Tikrit and extending west in a straight line to Haditha, marking the northern boundary. In the South it extended from the tip of the Gulf in the east to Qadisiyah close to the historic city *Al- Hirra*, the capital of the *Lakhmids* vassal Arab kingdom of the *Sasanian Empire* located to the west of the Euphrates. This kingdom had played an important role in the history of Iraq before and after the Islamic conquest. To the north of Sawad, the area between the Tigris

and Euphrates was named “*Jazira*”, meaning “*Island*,” as this land was enclosed between the two rivers. This part of Mesopotamia depended mainly on rain fed irrigation, except for its upper margins along the Khabour River in Syria; therefore, it will not be discussed in this narration, although, its fertility and large yield of crops such a grain and other cereal crops contributed enormously to the wealth and good of the successive empires.

Within four years after the death of the Prophet Muhammad in 632 AD the Muslim State had extended its sway over all of Syria and, at a famous battle fought during a sandstorm near the River Yarmuk the Muslim Arabs blunted the power of the *Byzantines* during the rule of ‘*Umar bin al- Khattab* . ‘*Umar*, who served as the second *Khalifah* (*Khalifah* means a successor to the Prophet Mohammad) for ten years, ended his rule with a significant victory over the *Persian Empire*. The struggle with the *Sassanid* realm was opened in 636 AD at *al-Qadisiyah* very close from *al-Hira* in Iraq, where Muslim cavalry had successfully coped with elephants used by the *Persians* as kind of primitive tanks. In the Battle of *Nihavand* (642), also called the “*Conquest of Conquests*”,) ‘*Umar* sealed the fate of *Persia*; henceforth, Mesopotamia was to be one of the most important provinces in the Muslim Empire. Iraq was the greatest prize of this conquest, and it was destined to be one of the wealthiest willayat (*Satrapy*) of the Muslim state.

The expansion of the Muslims from Arabia northwards, as explained already, was fueled by two important drives; the first one

was the desire to spread Islam according to the doctrine set by the *Quran* and the *Prophet*, and the second was the great prosperity and wealth of both the *Persian* and *Roman Empires (Byzantium)*. According to traditions recorded by Muslim historians of the ninth and tenth centuries, the account of the great colonizing drive was credible, and independent sources confirm this. In speaking of Iraq alone it cannot be overstated that this area was one of the wealthiest parts of the *Sassanid Empire* and the world. The agricultural economy was most advanced and prosperous and gave the empire its abundant financial recourse of taxes; and fueled at the same time trade and communal activities.

The *Sasanian* kings established numerous cities and settlements, forcibly transplanted thousands of prisoners from *Roman* territory and elsewhere in Mesopotamia and constructed great irrigation, and flood control works apart from those they preserved from the previous empires. It would seem that by the late *Sassanid* times, irrigation, settlements, and cultivation in Mesopotamia's flood plain had reached their pre-industrial maximum extent. All viable water resources were exploited in an effort to extend as to intensify agricultural production. Thus, summer cultivation involving various exotic plants (rice, sugar, cotton) had probably become widespread by this time. The kings employed corps of engineers as well as a group of specialist workers in maintaining irrigation works. Later on in the Muslim period, the army was occasionally used for emergency repairs. Scattered references indicate that the hard and exhausting work involved in

construction and maintenance of the great feeder canals must largely have been performed by unpaid slave labor. However, how the work force was mobilized and organized is not known. It seems that the digging and upkeep of the small canals were often done on a local communal basis. In any case, the purpose of the whole enterprise seems clear enough: it was to enlarge the tax base.

The Mesopotamian floodplain constituted the largest potentially irrigable area in southwest Asia and it was of crucial importance to the successive empires of that region; consequently, their kings determinedly attempted to maximize its agricultural and fiscal potential. There is no reason to believe that some sort of population pressure constituted the real “prime mover”. Population certainly increased in the process, but that was more likely a consequence rather than a cause of the expansion (4), (5).

Nevertheless, while the quantity of water was reasonably reliable, the irrigation system needed constant investment and maintenance. In this environment, almost all-major irrigation systems were gravity fed. This meant that water had to be carried in canals, which were higher than the surrounding land. This in turn meant that the system was highly vulnerable; breaches in the banks of the main rivers would cause water to flood out into fields and be lost, and even lead to the destruction of the canal systems.

There were other hazards; if the gradient were not steep enough, silt would be deposited on the bottom of the canals and would have to be re-excavated at a great expense. If the gradient were very steep, the

river would scour itself, but the pressures on the banks would be more serious. And then, as the cultivators of Basrah were to find in the ninth century, there was the issue of salinization; lack of proper drainage would result in the build- up of salts on the surface of the soil so that even the back breaking labor of thousand of black Zanj slaves could not restore the fertility. Such irrigation systems are also very vulnerable to financial and political issues. The constant required maintenance would suffer considerably in cases of lack of funds or during instabilities. Lack of maintenance will certainly lead to the ruin and the collapse of the agricultural system. In the canal- based agricultural systems of Mesopotamia, the destruction of a major canal might take years to repair, during which the inhabitants might move elsewhere or revert to the more secure economic refuge of a nomadic lifestyle ⁽⁶⁾.

During periods of weakness or trouble within the *Sassanid Empire*, especially during late stage, public works, irrigation systems and flood protection works within Mesopotamia suffered from neglect and lack of attention and maintenance, which caused some irreversible changes in conditions of southern Mesopotamia. Just few years before the Islamic conquest of Iraq, one historical event had occurred, which contributed to the Arabs victory on one side and changed the face of landscape of southern Iraq on the other. An account of this event was reported by the Muslim geographer and historian (*Al- Baladhuri*) who lived some centuries later during the Islamic era. In his book *Futûh– al- Buldan* (Conquering the Lands);

he described the great flood of the Tigris and Euphrates in 627/ 628 AD and the failed attempts to strengthen the neglected flood embankments, which led to the breaching of many sections of these embankments ⁽⁷⁾. This event was fully described in chapter 6, and the reader may refer back to it. All efforts to close these breaches were futile and the result was the flooding of the low lands at the southern part of Iraq between Missan and Basrah, and the formation of the “Great Swamp” which the Muslim geographers called “*Al- Bataih*” (the plural of *Batihah* signifying a “lagoon”).

At the same time the Tigris River changed its course at a point, called *Kut- Al- Amarah*, which is located at the medieval village called (*Madhraya*) downstream of the present day city of Kut. It took a new course to the west of the old one and followed the course of a smaller channel known as *Shatt al Hayy* as reported by LeStrange ⁽⁸⁾ which is called today as *Shatt- Al Garaf*. The old course was then named “*The Blind Tigris*” as the flow of water was cut off from it, and it had a blind end except for a small channel called *Nahr Abu-l- Asad*. All the efforts of the *Sassanid* to divert the water back to the old course failed and the dam they built for this purpose could not withstand the pressure of water and was washed away.

Two contemporary Iraqi Scholars Bashir Francis and Georges Awad, in their translation of LeStrange book cited above, have mentioned in footnote (1) on page 43 of their translation, that the new course was actually the course of the *old Dujayla canal* (not the Dujayla canal of today), and reported that the remnants of this old

canal can still be seen today ⁽⁹⁾. The importance of this event stems from the consequences of the change of the Tigris river course, and that all the irrigation water was cut off from the fertile lands east of the “*Blind Tigris*”. These lands, in the course of time, became barren land as described by (*ibn Rustah*) who visited the area in the 9th century ⁽⁸⁾.

The Tigris River, in its new course, after expending most of its water by irrigation channels, finally spread out at the Great Swamp, which also received more water from the Euphrates River during flood events. On this new course of the Tigris *Al- Hajjaj*, the governor of Iraq, during the reign of ‘*Abd al-Malik ibn Marwan*, the fifth *Khalifah* of the Islamic *Umayyad* dynasty, built the city of *Wasit* in 703 AD at the district called *Kaskar* as will be explained later on.

At the time of the Islamic invasion of Iraq *Kaskar* and *Maysan* were the two districts of the eastern part of the Great Swap. *Kazwini* (1227- 1304 AD) an Arab Muslim historian and geographer, who was born in the Caspian region of north *Persia*, described *Kaskar* as a very rich region, which produced excellent rice that was exported. On its pasture`s buffalos, oxen, and goats were fattened; the reed beds sheltered ducks and water fowl that were snared and sent in to the markets of the surrounding towns, while in its canals the shad- fish called (*Shabbut*) was caught in great numbers, salted and exported ⁽¹⁰⁾.

The whole area covered by *Al- Bataih* (Great Swamp) was dotted with settlements and villages, each standing on its canal, and though the climate was very feverish the soil, when drained was most fertile.

All districts of Iraq north of the Great Swamp, between the two rivers, were at that time traversed, like the bars of the gridiron, by a succession of canals, which were supplied by water from the Euphrates and drained eastward in the Tigris. While at the east of the Tigris, one canal 200 miles in length, called *the Nahrawn*, starting from below Tikrit and re-entering the river fifty miles north of Wasit, affected the irrigation of the lands on the further *Persian* side of the Tigris (6).

One of the natural consequences of the Islamic conquest was the sizable booty that fell into the hands of the conquering Muslims. Most of the wealth available to the conquerors was immovable because it came in the form of land. Much of the most productive land was Crown Land, and this, in addition to the land owned by local elite, became available to conquering Muslims through abandonment and confiscation. In the *Sawad* the 'black' area of alluvial soil in central and southern Iraq, where information is fullest, Crown Lands included not only all the properties of the *Sasanian* royal house, but also those attached to fire temples, post houses and the like. The second *Khalifah* 'Umar is said to have distributed four fifths to the soldiers and kept one fifth as his share as *Khalifah*, which was to be used for the benefit of the community.

As far as labour was concerned, 'Umar's policy was conservative: the peasants were left to work the land. This policy was part of a more general *laissez faire* style of ruling. In this policy non-Muslims who in the first decades of Islamic rule were generally

lumped together with non-Arabs, enjoyed wide ranging autonomy. Elsewhere abandoned lands were snatched up, and lands owned by those who had resisted (or could be said to have resisted) the Muslims, were confiscated. It may be that redistribution to conquering tribesmen was left to the discretion of local authorities. In some cases, such as the well irrigated and thus valuable land in the northern Mesopotamian city of Mosul, it is clear that ‘precedence’ was in operation, as we would imagine it to be: first come, first served; the best lands often went to the earliest settlers, although it appears, there was no land grab. Whatever the value of the booty and confiscated land, conquerors and conquered alike had to make sense of the momentous events. For Muslims, the conquests demonstrated God’s continued participation in human affairs ⁽¹¹⁾. The distribution of this land led to the land tenure system that prevailed later on for very long time during this era.

Muslims realized since the start, and just after settling in the new lands, that sustaining the agricultural production in all these rich lands can only be achieved through proper classification of land and a proper land tenure system. In the same connection, they were open to the fact that a fair taxation system coupled with clear collection methods would help to generate much of the funds needed for the proper functioning of the State. So a new system of land tenure was established, and taxes were imposed accordingly.

Tax on the agricultural land was called “*Kharaj*”. In the general meaning; *Kharaj* means all the revenues collected by the State which

go to the treasury and which shall be spent on the good of the public. As tax it also has the special meaning of the tribute imposed by the *Khalifah* on the yield of the agricultural lands. The term indicates the meaning of output of the land. This system was applied all over the concurred land, but with slight variations here and there according to the local conditions. In the *Sawad* the 'black' area of alluvial plains in central and southern Iraq, the lands were classified into three categories.

The First; were those agricultural lands taken by force (or by the Sword) during the invasion. They included the lands, which belonged to the Royal House, the elite class, and aristocracy, and the lands of the temples and the like as already mentioned. These lands were considered as endowment for the Muslims. The second were the lands abandoned by their owners, and they were treated in the same way as of the first category. Most of the "*Al- Sawad*" lands belonged to this type. The Third, land type was that which belonged to those people who surrendered to the authority of the invaders peacefully and concluded conciliation agreements "*Sulh*" with them. This type was treated according to the conditions stated in the "*Sulh*" agreement, so either the ownership was transferred to Muslims against compensations, or they were left to their original owners to use and cultivate but to pay *Kharaj* on them. Many large tracts of land belonged to this category in Iraq like "*Sawad Al Hira*", the area west of the Euphrates between Anbar and Basrah.

The estimation of “*Kharaj*” rates was left to the *Khalifah* or his authorized representative. This estimation should be based on the fertility of the soil, type of the crop, method of irrigation whether by gravity or by lift irrigation and in some cases the distant from the markets was also considered. The collection of the *Kharaj* revenues was done in one of three methods. Either by imposing it as per unit of area of the agricultural land, as was done by the *Khalifah* ‘Umer in *Al-Sawad*, or per unit area on the actually cultivated area, or even by taking a certain percentage of the crop yield ⁽¹²⁾. In his book *Futûh-al- Buldan* or “Conquering the Lands) of a 9th century Muslim historian, *Ahmed ibn Yahya al- Baladuri* already mentioned, he stated that during the rule of ‘Umar, the *Kharaj* tax was imposed on an area of thirty six million *Jareeb* which was equal to about fifty thousand square kilometers. This area represented then two thirds of all the cultivated agricultural lands in the delta between the Tigris and Euphrates rivers. It makes one eighths of the area of the present day Iraq⁽¹³⁾. During the early days of the Muslim settlement in the newly conquered lands, another new form of land ownership and a new type of tax emerged by necessity, especially in the lands around the newly built city of Basrah. This type was called (*qati’a*) and the tax was called (*ushur*), as it will be described in more details later on.

During the early days after the conquest, much work was done by the first four *Khalifes* to organize the administration of the new conquered lands and two new cities, “*Al-Basrah*” and “*Al-Kufah*” were founded in 638 AD.

The two cities were intended as encampments for the Muslim soldiers and settlements for their families. All the land around them was divided among the Muslim tribes who were in garrison here after the collapse of the *Sassanid Empire*. *Al-Kufah* became the capital of the *Islamic Khilafa* state during the rule of the fourth *Khalifah Ali bin Abi- Talib*, but after his assassination, the rule changed into the hands of the *Umayyad dynasty*, a competing clan from Quraysh, who then moved the capital to Damascus in *Bilad Al- Sham*. Even then Iraq kept its special place as the wealthiest and the most prosperous land within the lands of the new empire. One more city “*Wasit*” was built later on in Iraq during the reign of *the Umayyads*, and two other new cities, *Baghdad* and *Sammara*, were also built later on during the reign of the *Abbasid dynasty*, which followed the *Umayyads*. The building of these new cities reflected the need of centers for administrative, agricultural trade and military activities, and these cities became focal points of the *Khilafa* State, and played important roles in promoting the maintenance and construction of new irrigation projects and enhancing agriculture in *Al- Sawad*.

The choice of locations of the two new Islamic cities, *Basrah* and *Kufa*, was not dictated by economic consideration as much as for the need for establishing military bases, which were required to continue the conquest of what remained of the *Persian Empire* on one hand, and to facilitate the governance of Iraq on the other. *Basrah*, it is said was founded by the Muslim leader *Utba ibn Ghaswan* in (638AD) to

house the Arab army, which was then engaged in the conquest of southern Iraq, *Khuzestan* and *Persia (Fars)*.

The exact reasons for the choice of this particular site are obscure. It lay some fifteen kilometers in a direct line to the west of Shatt- Al Arab which was called then (*Fayd Dijla*) by the Arabs and (*Bahmanshir*) by the *Persians*, and therefore, had no direct access to the maritime trade of the Gulf and, at the same time, it was on the edge of the desert. All the evidence available today indicates that this area was barren and did not have any extensive agriculture hinterland. Furthermore, it clearly lacked adequate and reliable supplies of drinking water. Despite these apparent disadvantages, the role of the city as center where salaries were paid to the troops meant that the financial drawing power of the settlement proved sufficient, at least for a couple of centuries, to overcome the natural disadvantages of this situation. Population seemed to have grown in *Basrah* very rapidly, which resulted in a major campaign of investment in new irrigation projects in the land between the city and Shatt al- Arab, which is described in considerable details in *al- Baladuri's Futuh- Al buldan* ⁽¹⁴⁾. His account, which has already been studied by historians, is of great importance. It is the only account we have from Iraq of property ownership and land development in the first century of Islam.

The first canal to be dug in the area was intended to supply the new city with drinking water. Lack of drinking water had caused great hardship to the population, to the extent that they had sent one orator

named *al- Ahnaf ibn Qays* to plead *Khalifah 'Umer ibn al- Khattab* to alleviate this difficulty and to dig such a canal. *'Umer* was so moved by the orator's words that he immediately ordered his representative *Abu Musa al Ashari*, to dig a canal (*Nahr*).

'Umar himself regarded the provision of water as part of the function of government. The digging of canals was very expensive, but the project was deemed to be so important that the governor who was sponsoring it said that he would, if necessary, use all the tax revenues of Iraq on it. It followed that *Abu Musa* dug what became known the *Ubullā* canal from Shatt al Arab to Basrah and then extend it back in southeast direction to empty again in Shatt- al Arab. Maintenance of this watercourse was a constant struggle and much of *Abu Musa's* canal, had to be re-excavated by *Ziyad ibn abi Sufyan*, the governor during the reign of the *Khalifah 'Uthman ibn Affan* (644-560), the third *Khalifah* and the successor to *'Umer ibn al- Khattab*. At the same time, *'Umar* ordered *Abu Musa* to dig the *Ma'kil* canal. The *Ma'kil* canal led water from the Euphrates at the southern edge of *al Bataih* to the town and allowed boats with supplies from the rest of the *Sawad* to reach the city, while to the south, the *Ubullā* canal connected the city to Shatt- al Arab (*Fayd Dijla*). The two canals and Shatt- al Arab formed the Great Island, as it was called, in which *Basrah* stood; and the old city of *Ubullā* at its south east was located above the confluence of *Ubullā* canal with Shatt- al Arab.

These important civil engineering projects provided the city with drinking water, satisfied the mosques needs for ablution water, and

provided water to the public baths of the city. Additionally, they allowed boats carrying goods and provision to reach it from the rest of *Al-Sawad*. The two waterways allowed traffic to pass also from *Basrah* going southeast back to Shatt- al-Arab and then to the Gulf. The obligation of the government to provide drinking water is confirmed in other writings, which belonged to the end of the *Umayyad* period in the reign of the *Khalifah Yazid ibn al Walid* (744 AD). The logical consequence to the digging of these two canals was the raised interest in cultivating the land around *Basrah* and the construction of a dense network of irrigation canals. This new activity was also encouraged by the introduction of the new land tenure system known as the *qati'a* grant.

Al- Baladuri attributed the rapid development of *Basrah*, and the cultivation of the lands around it to this new *qati'a* system of land ownership, and to the reduced rate of land tax imposed on it. The idea underlying the concept of *qati'a* was that dead land (*mawat*), brought under cultivation usually by irrigation, but also by drainage or the clearing of bush, should become the property of the person or persons that had made it productive. It was held in absolute ownership and was alienable (it could be sold) and heritable. Moreover, the tax levied on such lands was the “*usher* which was much less than the higher *Kharaj* (land tax) paid on most agricultural lands. But it must be understood that “*usher* was only charged on *qati'a* when the granted lands required investment for digging canals, erecting farm buildings and other heavy expenses for the farming of the granted

qati'a. Such *qati'a* was developed by people rich enough to invest substantial funds in making the land productive. This indicates that the agricultural existence of the new towns encouraged a new class of entrepreneurs to invest in large scale irrigation works.

The *qati'a* system seems to have been constituted for the first time by *Khalifah 'Umer*, who ordered the granting of two plots of land under this system in two occasions. The first one, in a letter to *al-Mughira ibn Su'ba*, governor of *Basrah* instructing him to give *qati'a* to one *Abu 'Abd Allah Nafi' ibn Harith*, who had cultivated some land beside the Tigris in the area of *Basrah*. He used it as pasture to raise horses there. The other one being given to *'Abed al- Rahman ibn Nufy' ibn Masruh* nicknamed as (*Abi Bakra*), a former slave from *Taif* and one of the early converts to Islam, who had been one of the early settlers in *Basrah*, and he was in charge of engineering the digging of the *Ubulla* canal to *Basrah*.

Most of the canals serving the *qati'a* land were named after families and individuals and took the form of *Nahr* (this), or *Nahr* (that). It is the writing of *al- Baladuri* again which helped in constructing the picture of this development in the *Basrah* area in the first half of the first century of Muslim rule. The first major wave of canal's construction was undertaken during the governorates of *Abd Allah ibn Amir* in (649- 650) and (656- 661), and his successor *Ziyad ibn Abi Sufian* (665- 673). Examples of such canals were *Nahr Salm*, *Nahr Quotybatan*, *Nahr Um Habib*, *Nahr Um Abd Allah al- Dajjaja*, and *Nahr Humayda*. Non Arab citizens (*mawali*) who were in the

service of Arab Muslim landlords or clans also dug canals and named them in a similar way, such as *Nahr Fayruz* owned by *Fayruz* mawla of *Bani Thaqafi*, *Azraqan* canal owned by *Azrag ibn Muslim* mawla of *Banu Hanifa*, *Ziyadan* canal owned by *Ziad* mawla of *Banu Haytham* and many others. The *Aswira*, the *Persian* elite soldiers who had defected to the Muslims at the time of the conquest, were credited also with the development of a canal known as *Nahr Aswira*. Alongside with them was a group of *Isfahanis* who had migrated to *Basrah* and purchased land from some of the Arabs there, and who probably had converted to Islam at the time. In *al-Baladuri's* account, there was only one account of pre- Islamic irrigation works in the area; a canal and a palace belonging to *Nu'man ibn al- Mundhir*, the last king of *Hira* (580- 602), which was given to him in the days of *Kisra* (in the late Sassanid period). But it seemed to have been situated on the banks of the Tigris River not in immediate vicinity of *Basrah* ⁽¹⁴⁾.

The *qati'a* system seems to have survived the period of the early four *Khalifes*, and continued through the *Umayyad* dynasty period which followed. Some examples from this period may be cited here. The first was when the first *Umayyad Khalifah M'uawia* (608- 680AD) gave part of the area between the *Ma'kil* and *Ubulla* canals, which was at first largely *sabkha*, to one of his nephews as *qati'a*. But when the nephew arrived to inspect his new possession, the young man, was disgusted with the state of the land, which the Governor *Ziyad ibn Abehe* had arranged to have it flooded prior to his arrival,

and so *Ziad* bought the land for merely 200,000 dirhams, and then dug canals in it and made it into a fertile *qati'a*. The second case was when the *Khilafa Yazid ibn M'uawia* gave an area of eight thousand *jarbis* as *qati'a* to someone called *Hilal ibn Ahwaz al-Mazini*. It seems, however, that this *qati'a* was the subject of a law-suit which was raised by *al-Mazini's* son, *al-Himiyari*, who had discovered that this land had been taken over by another man *Bashir ibn Ubayed Allah*, who had dug a main canal, ditches and irrigated the land for cultivation. *Al-Baladuri* who reported the case does not tell us of the outcome of this law-suit. The other case also mentioned by *al-Baladuri* was when *Bashshar ibn Muslim al-Bahili* gave *Hajjaj* a particularly fine carpet; so the governor gave him an estate "and dug the canal called (*Nahr Bashshar*) to serve it" (14),(15).

The other army encampment, the city of *Kufa* was built about the same time as that of *Basrah* in 638 AD. The Companion of the Prophet *Sa'd ibn Abi Waqqas* built it on the desert side of the Euphrates, and occupied an extensive plain extending along the river bank adjacent to the old *Lakhmid* Arab city of *Al-Hirah*. After naming two governors, whom the inhabitants of *Kufa* had rejected, *Khilafa 'Umar* appointed *Al-Mughīrah ibn Shu'bah* as its governor. The city was located in the middle of *Al-Hirra Sawad* near to the site where the *Qadisiyah* battle was fought with the *Persians* in 636 AD, who lost it. *Mukaddasi* described *Qadisiyah* as a small town on the edge of the desert; its lands were watered by a small canal from the Euphrates.

But the area around *Kufa* itself was very fertile and highly cultivated during the *Sassanid* period.

The *Lakhmid* Arab population of *al-Hira Sawad* who owned most of the land here had surrendered to the authority of the invaders peacefully and concluded conciliation agreement “*Sulh*” with them. So they continued to own the land and cultivate it as before under the condition to pay *Kharaj* and an additional tax which was levied per capita known *Al- Jizyah* if they did not convert to Islam; but would be exempted from if they did so. Therefore, it is expected that the irrigation system did not need many rehabilitation works after the conquest except for major repairs that the farmers could not have done without the help of the State. *Al- Baladuri* in his description of the important sites around *Kufa* in the 9th century enumerated many monasteries and churches, which belonged to the Christian *Lakhmid Arab* population, such as: *Bi’at* (church) *bani Mazin*, *Bi’at bani Ayad*, *Dair* (monastery) *al- A’war*, *Dair Kurrah*, *Dair as- Sawa*, *Dair al- Jamajim*, *Dair Ka’b*, *Dair Hind*, *Dair Kumam*, and *Sikkat al Barid* (post office) in *Kufa*, which was once a church built by *Khalid ibn Abd Allah* ⁽¹⁶⁾.

In 657 AD the fourth *khalifah* after the Prophet *Ali ibn Abi Talib*, moved to *Kufa* and took it for his residence, but only to be assassinated in 661AD, at which event the *Khilafa* took a sharp turn and went to the *Umayyad* dynasty, which was another clan from *Quraysh*. The first *Umayyad Khalifah M’uawia ibn abi Sufian* moved the seat of *Khilafa* state to Damascus in *Bilad Al Sham*.

The first few *Umayyad Khalifahs* devoted a substantial part of their reign to political problems, but they always had their eyes on Iraq due to its wealth and large *Kharaj* revenue. So that as soon as *'Abd al-Malik ibn Marwan* succeeded to the *Khilafa* in 685 AD, he directed the cleaning and reopening of the canals that irrigated the Tigris-Euphrates Valley, the key to the prosperity of Mesopotamia since the time of the *Sumerians*. It is claimed by some writers that he had introduced the use of the Indian water buffalo in the riverine marshes ⁽¹⁷⁾, a claim which was disputed by many historians who believed that they were introduced by *Alexander* when he returned to *Babylon* from his Indian campaign. Others also had claimed that water buffalos were bred in the southern marshes of Iraq since the times of the *Sumerians*. Water buffalos were traded from the Indus valley civilisation to Mesopotamia since 2500 BC by the *Meluhhas*. The seal of a one scribe employed by an Akkadian king shows the sacrifice of water buffalo ⁽¹⁸⁾.

The need for another new city to be the *Sawad* capital seems to have risen during the reign of *'Abd al-Malik ibn Marwan*, and so the new city of *Wasit* in Iraq was built in 703 AD by the famous viceroy to Iraq *Hajjaj* who was appointed to govern Iraq by *'Abd al-Malik* in early 694 AD. This meant combining the governorships of *Kufa* and *Basrah*. *Al-Hajjaj's* purview originally excluded *Khurasan* and *Sistan*, which were in the heartland of *Persia*, but in 697/8 AD, he received these two provinces as well, expanding his rule over the entire eastern half of the *Khilafa* State. *Al-Hajjaj* at the mean time had embarked on

building *Wasit* and made it the seat of his government. This decision was dictated by strategic and economical consideration. The name “*Wasit*” means “*the middle city*” and it was so called because it laid at equal distance of 50 leagues, (equivalent to 75 miles) from *Kufa*, *Basrah* and *Ahwaz* in Persia. It was the chief town of the wealthy *Kaskar* district on the new course of the river Tigris, as was explained already. Before the foundation of Baghdad, *Wasit* had become one of the three chief Moslem cities of Iraq. *Wasit* was located in the heart of the rich agricultural region of *Al- Sawad*, and the city occupied the two banks of the Tigris River which were connected by a bridge of boats. The lands around *Wasit* were extremely fertile, and their crops provisioned all other towns in times of scarcity. Moreover, it also paid yearly into the treasury one million dirhams from taxes as reported by *Muhammad Abū’l-Qāsim Ibn Hawqal* who was a 10th century Arab Muslim writer, and geographer (8). After curbing, all the rebellions that rose against the *Umayyads* in Iraq *Hajjaj* turned his attention to the construction and improving of public works.

Dietrich in his “*Encyclopedia of Islam*” writes the following on *Hajjaj*’s works in Iraq:

“Following his victory over the Iraqis, al-Hajjaj began a series of reforms aimed at restoring tranquility and prosperity to the troubled state after almost twenty years of civil war and rebellions. He invested much effort in reviving agriculture, especially in the Sawad, and increasing revenue through the Kharaj land tax. He began to restore and expand the Sasanian era network of canals in

the lower Iraq. According to al-Baladhuri, he spared no expense to repair embankments when they broke, awarded uncultivated lands to deserving Arabs, and took measures to reverse the flow of the rural population to the cities, especially the new converts” (19).

In comparing with the ancient irrigation works of the *Babylonians* an early twentieth century famous British engineer Sir William Willcocks wrote in a report entitled “*Irrigation in Mesopotamia*” which was submitted to the Ottoman authorities who commissioned him to study the irrigation of Iraq; and he stated the following:

“It is worthy to remark that the only original reclamation works the Arabs carried out in the delta was an exact copy of this. In the days when Kufa, Wasit and Basra were the capitals of the Moslem world, before the rise of Baghdad, the energetic Emir Hajjaj of Basra reclaimed some 50000 acres in the Marshes between Kufa and Basra and converted them into one of the four earthly paradises of the Arabs. The ground was green carpet of lucerne, out of which rose stately Palm Trees, sheltering the gardens from the fierce heat of summer and severe cold of the winter; while from Date- palm to Date- palm, were fastened luxurious vines from which hung purple grapes” (20).

On the reclamation works which were carried out by *Hajjaj* wrote *Ibn Serapion* that *Hajjaj* had employed a *Christian Nabathaeon* called *Hassan* presumably an engineer to drain and reclaim lands in the Great Swamp⁽⁸⁾. *Hassan*, in our opinion, might have been one of the

Lakhmids inhabiting the land around *Hira*, who were very skillful in irrigation works.

The *Hira Sawad* was very important part of the Iraq *Sawad* throughout the *Persian* history, and it kept its prominence after Islam had established itself in the region. Therefore, some additional notes on those people may seem fitting. The *Lakhmids* of *al-Hira* were themselves Arab Christians, who had inhabited the area west of the Euphrates between *Anbar* and *Basrah*. They descended from the Arabs of the *Beni Tanukh* tribes that had emigrated with many others from *Saba'* (*Sheba*) which was a kingdom in southern Arabia (region of modern day Yemen). The exodus of the people of Yemen and their dispersal was due to the flood resulting from the frequent breaching of *Ma'rib Dam*. The dam, considered at its time as one of the greatest engineering feats of the ancient world, was built under the reign of the *Sabean mukarrib Yatha' Amar Watta I* (760-740 BCE), but it collapsed finally, most probably in 575 AD ⁽²¹⁾. Remnants of the dam are located about 150 km east of *Sana'a* where a modern dam was constructed lately.

In its good days, the dam supported a flourishing agriculture. Notwithstanding the dam good construction, it had been overtopped several times during its history, but always had been repaired. In the recurrent floods caused by such event, *Saba'* was flooded severely leading to the abandonment of towns and cities, and the inhabitants were forced to leave the area or starve. The *Ma'rib* dam provided such ample irrigation to the fields that crops were plentiful and were

harvested twice a year. The land was generous in its yield of wheat, barley, dates, grapes, millet, and other fruits. Wine was pressed from the grapes and exported as well as consumed locally. Irrigation of these farmlands was so successful that *Saba'* was consistently remarked upon as a "green country" by ancient historians such as *Pliny the Elder* (23-79 CE) who called the region *Arabia Eudaemon* (Fortunate Arabia). A term which later on was replaced by the Romans who used "*Arabia Felix*", and in Arabic literature, it was tagged to the term "*Happy Yemen*", thanks to the great skills of these people in cultivated irrigation. From all of these qualities, it may be concluded that those people were very skilful farmers ⁽²²⁾. Such skills as mentioned seem to have been transmitted generation after generation to the people of *al- Hira*, who in the exodus of their ancestors passed through *Najran*, and *Mecca*, where they were denied a stay, so they made their way to *al-Juhfa*, and then moved on to *Yathrib* (Madina). Here some of them stayed behind and were settled on the outskirts, while the rest left to Syria and others went to Iraq ⁽²³⁾. This fact explains the strong relations between the *Lakhmids* of *al-Hira* and Arabia and especially with *Yathrib* (Medina), which was so special, even to the extent that during the *Sassanid* influence over Medina, the governor of the city represented the *King of Hira*, a vassal to the *Persian King*, and was responsible for the collection of taxes for the *Sassanids* in this area.

These people found their chance to settle and establish themselves in Mesopotamia in the third century at the time when the

Parthian Empire was crumbling and opening the way for rise of the *Sassanids*. The *Hire'en* people were recognized by *Shapur II* (337-358), the tenth *Sasanian King*, so they ruled in central Mesopotamia as a vassal kingdom under the *Sassanids* with their capital at *Hira* which was established on the Euphrates River for roughly three centuries, from about 300 to 602AD, and the, *He'rins* occupied the area between *Anbar* and *Ubulla* to the left of the Euphrates and extended to the edge of the desert; Figure (48) shows the boundaries of *Sawad- Al Hira* and the location of *al- Hira* itself. Their other towns included “*Akola, Ain- Tamer, Ubulla, Hit, Ana* and *Baka*. The people of *al- Hira* are known in the Arabic sources as the *Hire'en* or more often *al- Manathirah* in reference to their Kings. History books also credit them with the fact that the *Sasanian King Bahram V* won the throne with support of *al-Mundhir I ibn al-Nu'man*, who was one of their famous kings. *Hira* became the center for Christianity since its early days and became a diocese of the Church of the East.

Al- Manathirah managed during the years to make advantage of their strategic position, living between the Euphrates River and the edge of the desert, and invested this in their relations with the *Persians*. The privileged position of their kingdom with respect to the *Sassanids* may have been due to the fact that the *Sassanids* themselves had lost control of the desert fringes after 602. By 604, their armies seem to have been comprehensively defeated in a battle by Arab's army alliance, which was to become famous in Muslim narratives- the so-called “*day of Dhū Qār*”,(Figure (48)). This was a

direct consequence of the act of the *Persian King Khosrau II Parvez*, who had murder *al- Nu'man ibn al- Mundhir* the king of *Hira* in a treachery. *Al-Ṭabarī* states clearly that *al-Nu'mān's* fate was the cause of the battle of *Dhū Qār*," by which he implied that had *Khosrau* retained the alliance with the *Persian* Arabs, the *Sassanids* may have resisted their enemies the *Byzantines* more effectively ⁽²⁴⁾.

Generally, *Al- Manathirah* were intermittently, the allies and clients of the *Sasanian* kings of *Persia* with especially close links during the sixth century when they were bulwarks of the *Sasanian* positions in Mesopotamia against *Byzantium* and its Arab allies in Syria. Moreover, their close links with the Arabs of *Yathrib* (Medina) enabled them to represent the *Persian* influence in Arabia even to the level that enabled the *King of Hira* to appoint a governor (*'Amel*) for Medina. *Ibn Sa'id* furnishes us with details on this, and record that *'Amer ibn Utaiba* was appointed by *al- Numan ibn al- Mundir* as a governor of *al- Medina*.

In shedding light on the duties of the kings of *al-Hira* as vassals to the *Persian* kings and the reward they received in the form of agricultural lands. Kister ⁽²⁵⁾ quotes from the book "*al-Manaqib book of Abu al- Baqa*" that they were instruments in taming the Bedouins who used to raid the borders of the empire, but they were rewarded for their services, where he says:

"The Chosroes (Kings of Persia) granted the rulers of al-Hira some territories as fiefs (qati'a) and assistance for them in their governorship. They collected the taxes of these territories and used

them for their expenses. They bestowed from it presents on some of their own people and on people (of the Bedouins) whom they blandished and tried to win over. Sometimes they granted them localities from the fiefs presented to them”.

Kister points out that these fiefs were restricted to border lands in the vicinity of *al-Hira*. The rulers of *al-Hira* could not trespass on other lands, because the territories of *Persia* belonged to the *Dihqans* who vied among themselves for their possessions. These lands were very fertile and *Abu al Baqa* records details about the amount of taxes collected by *al-Nu'man*, king of *al-Hira*, from the fiefs granted to him by the *Persian king* as “*the sum was 100,000 dirham or 5 kg of silver*”. On the fertility of the lands, he speaks:

“The fertility of the lands, yielded a yearly average of 30,000 kurr (81000 tons of wheat) in addition to fruits and other produce” (25).(26).

When *Khusrau II Parvez* appointed *Iyas ibn Qabisa* as ruler over *al-Hira* after the assassinating of *al-Nu'man ibn al-Mundhir*, he granted him “*Ain-Tamar and eighty villages located on the border of the Sawad.*

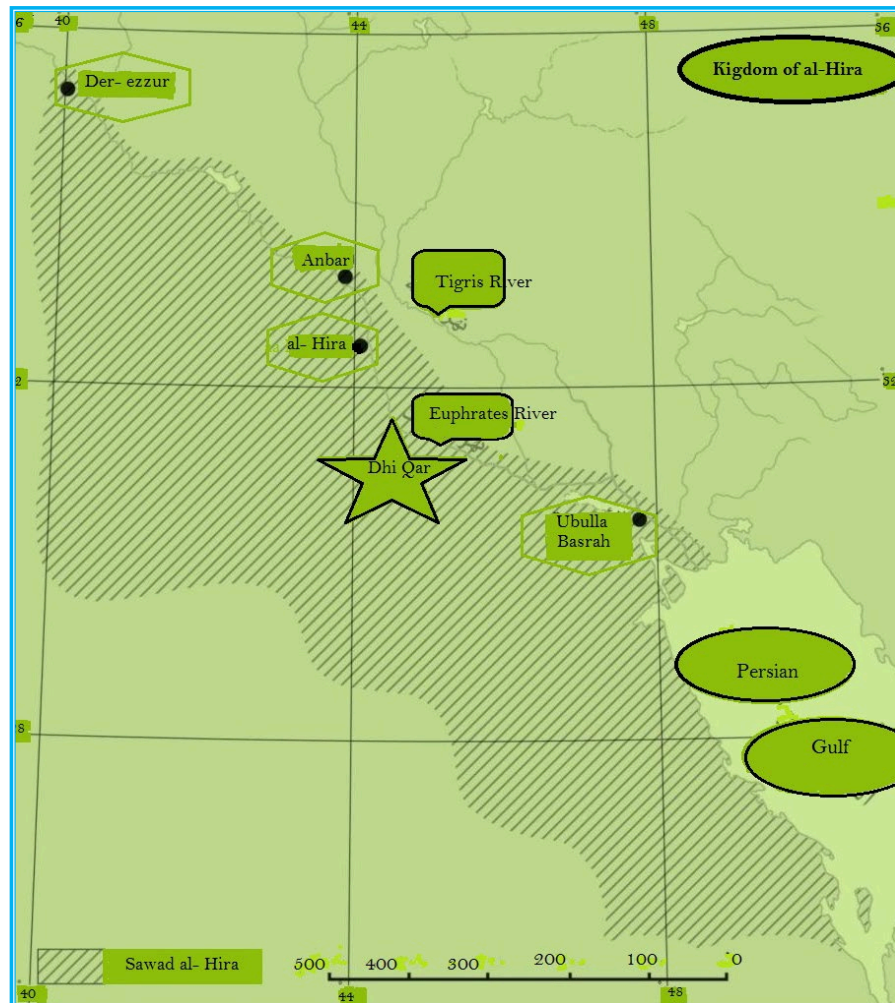


Figure 48: Sawad al Hira, showing the location of Dhi-Qar battle between the Arabs and the Persians (609AD)

So this was the state of affairs in this important and fertile part of Iraq at the time of the Muslims conquests, and as *al- Hira Sawad* surrendered to the conquerors in a “*Sulh*” agreement, they were entitled to keep their lands for themselves. The reason of this peaceful surrender to the Muslims was mainly due to the preference of the Christen population of *al-Hira* to live under the rule of their brethren Arabs, even being of different religions, rather than the *Persians*, whom they disliked. Moreover, they desired to keep their current prosperity that was guaranteed by the conquerors. This prosperity was

insured by their fertile lands, which they kept under their ownership, in contrast to the *Persian Dihkans* lands, which were confiscated.

No doubt an important reason for such prosperity was due to their skills in irrigation, which they had inherited from their ancestors from Yemen. In addition, their date- palms orchards, farms and vineyards extended in the entire domain from Najaf of today to the Euphrates. They produced all sorts of crops, which ranged from dates, barley, and grapes to millet, wheat, and assorted fruits, and they were renowned for their skill in making especially good wine from the grapes they used to grow.

The *Sulh* agreement allowed the people of *al-Hira* who were very active traders to continue their trading relations with India, China, Oman, Bahrain, Hejaz, Horan and Palmyra by sailing their boats in the Euphrates and the Gulf, or by driving their caravans for very long time after the Islamic conquest. In its close proximity to *Kufa*, it was visited for its refreshing parks and bars, which exceeded in its number anywhere else. *Yakut* mentions that it was densely populated during the *Umayyads* time, but although, it was visited frequently by the *Abbasid Khalifahs*, *Abu al- Abbas*, *al- Mansur*, *Haroun al- Rashid* and *al- Wathiq*, for its fresh air, it began to decline during the late days of *Khalifah al- Mu'tadid* (27).

It may be said that a state of prosperity had prevailed in the land of *al-Sawad* extending from *Basrah* and *Wasit*, to *Kufah* and *al-Hira*, during the *Umayyad* dynasty rule which had lasted for 89 years from 661 AD to 750 AD. During this period, which *Hajjaj* served as the

governor of Iraq for 20 years from 694 AD to the time of his death in 714 AD. This period marked the best time not only for agriculture and irrigation works that he had carried out in Iraq, but for all the other administrative works and organization he had fostered. The Encyclopedia Britannica speaks of him as the most able of provincial governors under the *Umayyads* rule and adds:

“Hajjaj first became publicly active when, in the reign of the Khalifah ‘Abd al-Malik, he restored discipline among troops being used to repress a rebellion in Iraq. In 692 he personally led troops in crushing the rebellion of ‘Abd Allāh ibn az-Zubayr in Mecca. The brutality with which he secured his victory was to recur during the rest of his public life”.

The Encyclopedia Britannica adds:

“For several years, he was governor of the provinces that surrounded Mecca, but in 694 he was made governor of Iraq, which, because of its location and because of the intrigues by various sects there, was the most demanding and the most important of the administrative posts in the Islāmic empire. Al-Ḥajjāj was completely devoted to the service of the Umayyads, and the latter were never fearful of his great power. He was instrumental in persuading the Khalifah ‘Abd al-Malik to allow the succession to pass to al-Walid, who, as Khalifah, allowed al-Ḥajjāj complete freedom in the administration of Iraq. Al-Ḥajjāj did much to promote prosperity in his province. He began to strike a purely Arab coinage that soon replaced older currencies. He stopped the migration of the rural

population to the towns in an effort to improve agricultural production, and he saw to it that the irrigation system was kept in good repair” (28).

The end of the *Umayyads* dynasty (661-750AD) was brought about by a violent rebellion and fighting as in most of similar cases in the history of Mesopotamia. Fighting would continue for some time, but finally the victorious would emerge and inherit all of what had belonged to the loser. Ordinary people, however, would resume their usual life and go about their business in as similar ways as they used to do before. In such way the people of the land of Iraq *al- Sawad* continued their lives in the new *Abbasid* era which followed, being farmers, artisans or traders. Cultivation of the fertile lands of Mesopotamia also continued to be the main source of income to the new State of *al- Khilafa*.

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Agriculture and Irrigation of Al- Sawad during the Early Islamic Period - And Baghdad Irrigation -The Booming Period-

The rivalry between the *Umayyads* and other Muslim factions over the right to the *Khilafa* had never ebbed during the *Umayyads* dynasty reign (661- 750 AD). The other contenders were the Shiites of Ali, who believed that the *Khilafa* should belong to the descendants of Ali ibn Abi Talib, the fourth *Khalifah* after the death of the Prophet Mohammad, and his cousin and son in law. Others were the *Abbasids* that believed that the right heirs to the *Khilafa* were the descendents of *Al Abass ibn Abi Talib* the uncle of the Prophet. The *Abbasids* rose in rebellion against the *Umayyads* after building coalition with the Shiites and the other disgruntled groups that were mainly the “*Mawalis*”, as the *Umayyads* called the Persians and the eastern Arabs, who were treated differently from Syrian Arabs.

Rebellion erupted in *Khurasan* in *Persia* led by *Abu Muslim Al Khurasani*, who fought the *Umayyads* and defeated them and occupied *Maru*, the capital of *Khurasan*, and established the *Abbasid Khilafa* there. From *Maru*, the head of the rebellion, *Abul Al-Abbas as-Saffah* moved to *Kufa* in August 742 AD, but he remained in hiding till October 750, when he was declared as the *Khalifah of the Muslims*. Final defeat of the *Umayyads* army came just afterwards in the battle of Zab in the north of Iraq located between Mosul and Erbil.

The *Abbasids* then completed the conquest of the whole of Iraq followed by *Bilad al Sham* and Egypt. *Abul Al-Abbas As-Saffah* captured Damascus in the mean time and slaughtered the remaining members of the *Umayyads* family to the last one except for, *Abd al-Rahman* the great grandson of *Khalifah Abdul Malik*, who escaped to Spain and continued the *Umayyads* dynasty rule there. By this *Abul Al Abbas* earned the title *As-Saffah* which is the synonym to “*Slaughterer*”, and he became the first *Abbasid Khalifah* and the twentieth *Khalifah* of the Muslims after the Prophet Mohammad, but his rule only lasted from 750 to 754 AD.

After establishing himself as *Khalifah*, *Abul Al- Abbas* moved from *Kufah* and took a new residence in *Hashimiyah*, then moved to *Anbar* where he died. As it had happened before after upheavals and political troubles, the system of land cultivation and irrigation in *Al-Sawad* did not suffer much change during this period for the simple reason that most of the cultivation and maintenance works were done by the *Nabathaeans (Lakhmids)*. Those were the non-Muslim populations that were already there even before the Muslim conquest and who were from *Aramaic* origin, and also by the *Zanj* slaves working for the Muslim landlords who had owned possessions of agricultural lands after the Islamic conquest.

The *Lakhmids* had previously worked either for the *Persian* landlords, or had owned the lands themselves. In such case, the land was left to them by the Muslims as per the conditions of the peace agreement (*Sulh*) on account of their peaceful surrender to the

Muslims at the onset of the conquest and conditioned by paying the required (*Kharaj*) and (*al- Jizyah*) taxes. Muslims after the conquest interfered very little with the agrarian organization and left it as it was in the previous days of the *Sassanids*, and even added some reforms, which improved the conditions as far as land ownership and land taxes.

During the *Persian* era, each village had a chief called (*Dahkan*) to which all the peasantry in the village would answer to, and would work for. As the time progressed, Muslim land owners gradually started to appear and the role of the *Dihkans* changed gradually to tax collection ⁽¹⁾. This arrangement made the continuation of cultivation of the land possible during these transitional periods. Moreover, new lands were reclaimed during the reign of the first four *Khalifahs*, and similarly during the days of the *Umayyads*. This was a direct result of the establishment of the new Islamic cities of *Basra*, *Kufah* and *Wasit*, and the adoption of the (*qati'a*) land ownership system, which encouraged private investment in constructing new irrigation projects.

It may be assumed therefore, that at the beginning of the *Abbasid* period all the irrigation networks and farm structures were in good working conditions, and that all the required work force was available as all these were left to them from the late *Sassanid* and *Umayyads* periods.

After confiscating the lands that belonged to the *Umayyads* and their followers, the *Abbasids* carried out tax collections on all cultivated lands in the same way as the *Umayyads* had done before to

finance their new established *Khilafa* State. The *Kharaj* money collection and its spending were the duty of *Diwan Al Kharaj* (the treasury). The collected *Kharaj* was normally spent to pay salaries of the army and the various officials and administrators of the government, and also on the construction and maintenance of public works, in addition to covering the lavish spending on the *Khalifah's* household and building of new great palaces and even new cities such as *Baghdad* and *Sammara*.

Diwan Al- Kharaj had always allocated sizable amounts of money to take care of; irrigation works maintenance, and improved agriculture and even took steps to help farmers by supplying them with seeds, oxen for tillage and the services of engineers and experts in water supply matters, and helping them with loans ⁽²⁾.

It was clear that the vitality and existence of the *Khilafa State* depended on *al- Kharaj* money, which was derived from cultivating the vast land of *al- Sawad* and to a lesser extent from the other parts of the state. During the *Abbasid* era, and even before that, irrigated agriculture was practiced all over *al- Sawad* districts while rain fed agriculture was the common method of irrigation in the *al- Jazira* area, north of *al- Sawad*, which extended from Mosul and upwards in the lands between the two rivers. Irrigation from springs and *qanāt* or *karez* was also common in the foothills areas of *al- Jazira* east of the Tigris River. Gravity irrigation, however, was also practiced in *al- Jazira* on the banks of the Euphrates and especially in the Khabour

tributary districts where agriculture was flourishing and fields and plantations were very dense.

Much writing has come to us from the 9th and 10th centuries, which were considered as the golden period of the *Abbasid* era. These writings were from Muslim scholars and geographers, who wrote their accounts on the various aspects of life of the *Abbasid Khilafa* at that time, which included also their narrations on agriculture and irrigation in addition to describing the newly built cities of Baghdad and Samarra. The map of Iraq in Figure (49) shows the locations of the five Islamic cities, *Basrah*, *Kufah*, *Wasit*, *Baghdad* and *Sammara*, which were all built in Iraq during the Islamic period up to and including the *Abbasid* period.

Around these cities, the irrigation systems and cultivated lands were outspread and covered the whole of *al- Sawad* in one continuous green carpet of lush plantations and fields. The same map shows also the main roads leading to other regions, and it indicates the Great Swamp (*Al- Bataih*) that was formed after the famous 628/629 flood of the two rivers, in addition to, the change of the course of the Tigris river after that flood ⁽³⁾.

The irrigation networks of *al Sawad* described by the Muslim scholars and geographer were already in existence before the *Abbasids* and the *Umayyads*, and a great deal of these canals had survived since the *Babylonian* times under different names. Some other canals were constructed by the *Sassanids*, who made a grand job of this work, helped by the fertility of the delta. Changes had

occurred, however, on these networks during this long time due to the changing courses of the Tigris and Euphrates Rivers after great floods. Nevertheless, the full potential of the land was realized most of the time. It is therefore, natural to refer to the writings of those Muslim Scholars when anyone attempts to learn more on the *al-Sawad* geography and its human and agricultural environment during the Muslim era.

Such writers, who may be described as eyewitnesses very close of major events, were many, and we can mention famous names. These are; *Iskharti* (Died in 957 AD), *al- Ya'qubi* (Died in 879 AD), *ibn Hawqal* (943- 988 AD), *al- Maqdasi* (946- 991 AD), *ibn Jubayr* (1145- 1216 AD), *ibn al- Mustawfi* (1169- 1239), *Yaqui al- Hamawi* (1179- 1229 AD), and *ibn Batuta* (1304- 13 69 AD).

The writings of these scholars give vivid descriptions and rich accounts of the various parts of this region during the *Abbasid* period, and reported especially the great extent of irrigation works that supported agriculture there. *Istakhri* for example, wrote on the dense palm tree gardens around *Basrah* and along its canals. He went on to say that the palm trees' gardens had extended for a distance of fifty *farsakh* from a small village called *Abdasi* at the north east of the great swamp (*Batihah*) to *Basrah* and then down to *Abadan*; he also mentioned the palm trees' plantations along the *Ubullah* canal which extended for a distance of four *farsakh*. In his description of its beauty, he thought of it as being one of the four earthly heavens,

while not missing at the same time to mention the other palm trees' groves on the banks of *Ma'kil* canal.

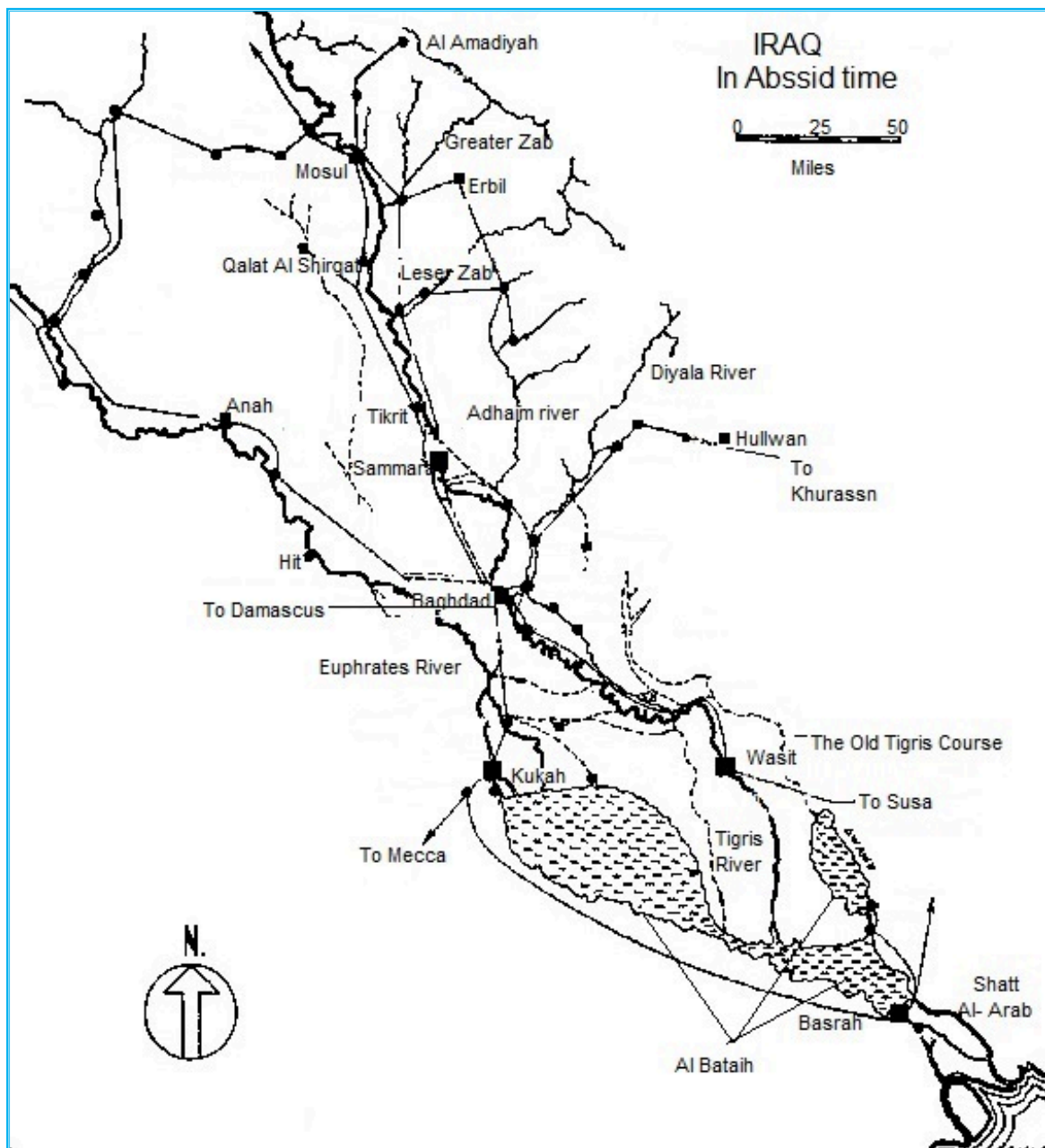


Figure 49: Map of Iraq during the *Abbasid* time. The map shows the important cities and roads at that time, it also shows the Tigris and Euphrates and *Al-Bataih*. The map is taken from the book ‘Twin Rivers’ by Seton Lloyd ⁽³⁾. Many other details are removed by the from the original map by the writer for the sake of clarity.

The irrigation system of *Basrah* canals, as were described, had a unique property; since most of the canals were supplied by water

twice every twenty four hours when the tide of the Gulf would raise the water level in *Shatt al Arab* and would fill these canals with water, so all the fields and the palm groves were irrigated automatically.

Other writings such as those by *al- Maqdasi* mentioned that rice was grown in the shallow parts of the great swamp (*Al Bataih*) and its periphery, which extended up and close to *Wasit*, in addition to the dry patches of land within the swamp itself. *Wasit* itself, by the same account, was very rich in palms groves, gardens and extensive rich fields. In following more of these writings, we come to the description of *Kufah* by *Ibn Jubayr*, who wrote that the eastern bank of the Euphrates River in *Kufah* had dense groves of all sorts of fruit trees, and in the western bank of the Euphrates, farms and tree groves extended as far as *al- Hirra* and *al- Qadisiyah* on the edge of the desert.

Istakhri again wrote that all the lands between Baghdad at the north and *Kufah* in the south, and from *Dujaela*, the new course of the Tigris after the flood of 629 AD, in the east to the Euphrates in the west, all the land was so crowded with farms and cultivations that it was not possible to distinguish between the different farms, and it was also crowded with towns and villages as well.

All these writers agreed that agriculture had flourished and prospered because of the extensive irrigation canal networks not only in lower *al- Sawad* but also in the areas of *Baghdad* and *Samarra* and to the east from the Tigris River as far as *Hulwan* in the foothills of *Persia*.

To describe the waterworks and irrigation canals that crisscrossed *al-Sawad* from north to south, the course of the Euphrates will be followed from where it enters the delta to where it ends in *Al- Bataih*. The same procedure will also be followed for the Tigris River but not failing at the same time to mention that a great deal of the information on these waterworks are obtained from the writings of *ibn Serapion* and other contemporary authors.

A great deal of these information were compiled and commented upon in G LeStrange book "*The land of the Eastern Caliphate*" which was published in 1905 ⁽⁴⁾. The book was based on LeStrange's translation of the Arabic MS which is kept now in the British Museum Library which was written by *Ibn Serapion*, a Syriac author and physician, who lived in the second half of the 9th century, and described Mesopotamia and Baghdad. Moreover, this MS. included references to the writings of many of the Muslim scholars, and geographers mentioned previously, who themselves were contemporary with that period.

A straight line carried from the Tigris at Tikrit to the Euphrates would cross the river a little below Anah, where its course makes a great bend, and this is the natural frontier between *Jazira* and *al-Sawad*, as marked by *ibn al-Mustawfi*. To the south of this line begins *al-Sawad*, or the alluvial land, while to the north lie more stony plains of Upper Mesopotamia. The city of Haditha on the Euphrates, about 35 miles below Anah, is the northernmost town on this side, which *Yakut* had described as possessing a strong castle surrounded by the

waters of the Euphrates, and it was founded during the *Khilafa of 'Umer* not long after the Muslim conquest.

Downstream of Haditha the town of Hit is reached, which *Yakut* referred to as a small ancient town that still existed. *Ibn Hawkal* spoke of Hit as a very populous town, and *Ibn al-Mustawfi* in the 13th century described that more than 30 villages were around Hit. He mentioned the immense quantities of fruit, both of the cold and the hot regions, which were grown here; nuts, dates, oranges and egg-plant all ripening freely, but not pleasant to live in on account of the overpowering stench of the neighboring bitumen springs. From the Euphrates at Hit ran the famous trench that was excavated by the *Persian King Shapur II* (309- 379 AD) whom the Muslims called (*Shabour Dhu- l- Aktaf*), meaning (Shapur with the broad shoulders), and according to Arabic literature the trench was also called (*Khandak Shapur*). Sousa, a contemporary Iraqi engineer and historian, casts doubts on the originator of this trench, and claims that its digging may be attributed either to the *Babylonian king Nebuchadnezzar* (605 –562 BC), or the *Persian King Khosrau I Anushirvan*, who reigned during (531-579 AD). Sousa, however, does not produce any evidence to support this claim. He also quotes Sir William Willcocks, the British engineer who had studied the irrigation of Iraq in the beginning of the twenties century of saying that “he had traced the remains of this canal, and it branched from the Euphrates seventeen kilometers south of Hit” (5).

The trench ran all the way down to reach the Gulf at *Ubullā* (near *Basrah*). Originally, it carried water and it was intended as a line of defense for the rich lands of Lower Mesopotamia against the desert tribes.

Our opinion on this issue, however, is; that the trench may have been a prehistoric course of the Euphrates and not a man made channel, and that it may have been modified for defense purposes. This opinion is reached on account of its huge magnitude and the long distance it traversed down to the Gulf, in addition to the usual historic trend of the Euphrates and Tigris of frequently changing their courses throughout history as they enter the delta region.

Next on the course of the Euphrates was the city of *al- Anbar* “*the granaries*” standing on the left bank of the river. It was one of the large cities of Iraq in *Abbasid* times, and it had dated before the Muslim conquest. It was called “*the granaries*” because the *Persian* kings had stored the wheat, barley and hay for the rations of their troops in the city. The first *Abbasid Khalifah Abul Al- Abbas as-Saffah*, had for a time made Anbar his residence, and he died in the palace which he had built here. His brother and successor *Abo Jafar al-Mansur* lived also for a short time at Anbar, and from here he moved to Baghdad; the new city he built and made it the new capital of the *Islamic Khilafa*.

At the time of building Baghdad there had been already one large canal, which branched from the Euphrates at a point about twelve leagues (58km) downstream from Hit. This canal was called (*Dujail*

Canal) which should not be confused with the other *Dujail* canal that branched from the right bank of the Tigris near Tikrit, which ran all the way down to reach Baghdad itself.

By the close of the 10th Century, and according to *Iskharti*, this *Euphrates- Dujail* canal had already silted up in its uppermost portion so the remaining lower reach ceased to receive water from the Euphrates. This had required the digging of a short channel taken from the *Tigris- Dujail* to connect to the lower reach of the *Euphrates- Dujail* in order to continue the irrigation of the district called Maskin north of Baghdad and cover the needs of the *Harbiyah Quarter*, the northern districts of western Baghdad in the same way that the *Euphrates- Dujail* was doing before.

Going down further south the next canal branching from the Euphrates was the grand *Nahr –Isa Canal* that had its intake at a little distance downstream from *Dujail Canal* offtake and flowed in a parallel course in the direction of Baghdad. These two canals provided Baghdad and surrounding fields, farmlands and date- palm groves with abundant water supply, as will be explained in details later on.

The round city of Baghdad which was the original core of western Baghdad, was built by *Khalifah al-Mansur* in (762–767AD) as the official residence of the *Abbasid* court. The significance of the site of the new city was in the availability of abundant water and the decrease of the dangers of flooding. This in turn led to the expansion of the city and increased its influence. Providing a bridge across the

Tigris River here had provided a good link with the left side of the river and continued communication with the eastern parts of *al-Sawad* all the way to *Hulwan* in *Persia*. The Tigris penetrated the city and divided it into two parts *Karkh* (western part) and *ar-Rusafa* (eastern part) ⁽⁶⁾.

The original round city had three concentric walls, and an outer deep moat filled with water, four equidistant gateways being left in each of the circuits of the walls. These were, *Basrah gate* (SE), *the Kufah gate* (SW), *the Khurasan gate* (NE), and *the Syrian gate* (NW). The first two of these gates opened on the *Sarat canal*, which branched from *Nahr Isa*, while the third gate, which was on the Tigris led to the main bridge of boats; and the last led to the high road to Anbar on the Euphrates.

Unlike the *Greek*, *Roman*, and *Sassanid* kings, who named cities after themselves, *al-Mansur* chose the name *Dar al-Salam* or “*Abode of peace*,” a name alluding Paradise. Furthermore, he did not object to the use of the ancient city name “*Baghdad*,” although many people used to call it the city of *Al-Mansour*.

The city gained later on many more appellations, including *al-Mudawara*, meaning around city, because of its circular form, and *al-Zawarh*, meaning the winding city, because of its location on the winding banks of the Tigris. But one of the main reasons of getting the city its present name was that *Abo Jafar al-Mansur* had built the city in the location of the village which was known as (*Baghdad*) since the days of *Hammurabi*.

The name “*Bjaddada*” appeared on a clay tablet dating back to the eighteenth century BC, and in days of *King Hammurabi* “*Baghdadi*” was the name of the same place which appeared on another clay tablet dating back to (1341- 1316 BC). On another tablet the name “*Bjaddado*” again appeared in a historical document from 728 BC during the reign of the *Assyrian king Tglat Flasar III* of (727-745 BC).

The location of the city was of very high strategic value being right at the center of Mesopotamia. It was therefore, a meeting place for caravan routes on the roads to *Khurasan* and *Bilad Al-Sham* (*Syria*). It had a system of canals that provided water for cultivation and could be used as ramparts for the city; moreover, it also had adequate drinking water supply for the people and provided an environment more or less free of malaria ⁽⁷⁾.

These considerations must have contributed to the choice of this site as explained by LeStrange in the following statement:

“The new capital would then stand in the center of a fruitful country, not on the desert border, as was the case with Kufah and the neighboring towns, for the barren sands of Arabia come right up to the bank of the Euphrates. By a system of canals, the waters of the latter river were used to thoroughly irrigate and fertilize all the country laying between the two great systems, and while the waters of the Tigris were kept in reserve for the lands on the left Persian bank; and thus the whole province, from the Arabian Desert on one side to the mountains of Kurdistan on the other, was to be brought under

cultivation and converted to a veritable garden of plenty. Lastly, the Lower Tigris before its junction with the Euphrates was more practical for navigation than this latter river, inasmuch as the great irrigation canals, by effecting drainage of the surplus waters of the Euphrates into the Tigris, scoured the lower course of this river, and kept the waterway clear through the dangerous shallows of the Great Swamp immediately above Basrah estuary ⁽⁴⁾.

Nahr Isa, which in addition to its abundant water was at the same time the first navigable canal from the Euphrates to the Tigris. So the town of *Anbar* gained more importance due to the fact that it was laid in its position on the head of the first navigable canal that flowed from the Euphrates to the Tigris, which it entered at the harbor (*Al-Fardah*) in Baghdad. *Nahr Isa* took its name from an *Abbasid* prince, *Isa*, who was either *Isa ibn Musa*, a nephew of *al- Mansur*, or *Isa ibn Ali* (the more usual ascription), the uncle of *al- Mansur*. In either case, *Prince Isa* gave the canal its name; he has re-dug it, had also enlarged it, making it thus a navigable canal from the Euphrates into Baghdad.

The canal was excavated originally during the *Sassanid* era for irrigation purposes only, and some sources mention that its original name was *Tabik Kisrawi*, and that it was dug by a *Persian* whose name was *Babik ibn Bihram ibn Babik* ⁽⁸⁾.

Where the canal had left the Euphrates, a short distance below *Anbar*, it was crossed by a bridge called (*Kantara Dimmima*), near the village of the same name, close to the hamlet of *al- Fallujah*, then it came after some distance to the town of *al- Muhawwal*, one league

(about 4.8 kilometers) distance from the suburbs of west Baghdad. At this point, an important canal branched from the left side of the *Nahr Isa*; which was called the *Nahr Sarat*.

Another important canal branched from the right side of *Nahr Isa* about one mile below the *al-Muhawwal* town, which was the *Karkhaya canal*. According to the description of *Ibn Serapion*, the *Karkhaya canal* was great loop canal supplying water to the other secondary canals that traversed the *Karkh* district of west Baghdad, and it is said to have been dug at the time of the foundation of Baghdad by *Isa* (the uncle of the *Khalifah*). The canal, after giving five branches from the left side and one from the right, discharged its remainder back into *Nahr Isa* canal. The five left-hand branches just mentioned were supplying the various quarters of the city and they were called *Nahr Razin* or *Nahr Attab* in its lower course, *Nahr Bazzazin* (*Canal of Cloth-merchants*), *Nahr- ad- Dajjaj* (*the fowls' canal*), and *Nahr- Kilab* (*the canal of dogs*). The sixth branch which took its water from the right side was called *Nahr- al Kallayin* (*the canal of Cooks who sold fried meat*) ⁽⁹⁾.

In its upper reach, *Karkhaya canal* was a broad canal that needed to be crossed by arched stone bridges (*Kantarrah*), the lower branch canals, and the watercourses of *al-'Amud* and the *Tabik* were evidently much smaller water courses, since no such bridges were needed for the high roads to cross them. Many more watercourses were then dug within west Baghdad for its water supply system;

dykes and reservoirs were built and even drains to drain the swamps around Baghdad, freeing the city of malaria ⁽¹⁰⁾.

It may be said therefore, that water for irrigation and municipal use for the *Karkh* area (western Baghdad outside the round city), was supplied from the canals which branched from the Euphrates, and only some parts in the northern edge of the city were supplied from the Tigris. A clear idea of the density of these canals may be obtained by referring to Figure (50).

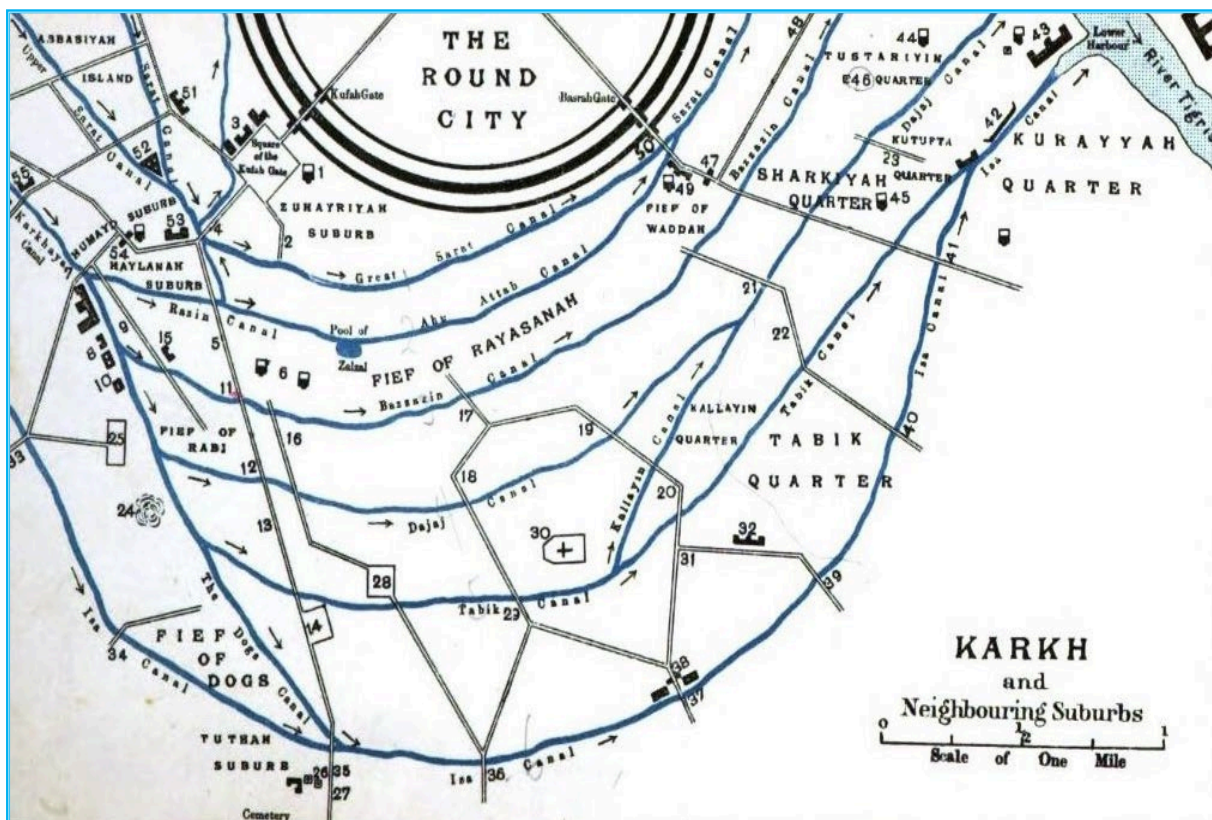


Figure 50: Canals and Watercourses of Karkh neighboring suburbs ⁽⁹⁾.

Now if we go, back to *Nahr Sarat* canal which was already mentioned, which branched from *Nahr Isa* upstream from *al-Muhawwal*; this canal formed along its course the dividing line between *Katrabull* district to the north and *Baduraya* to the south of

the west Baghdad area. Generally, it ran south of *Nahr Isa* and parallel to it and after one league (about four kilometers) from it's off-take it bifurcated into two branches. The left branch was called *Khandaq Al- Tahir* (Trench of al-Tahir), which after a short distance fed another canal on the right side called the *Little Sarat*, which finally, after watering the adjacent district, poured back in the main *Sarat Canal*.

Both the streams of *Nahr Isa* and the *Nahr Sarat* poured their remaining water back into the Tigris immediately below the *Basrah Gate* in two separate ports, which were the *Upper Fardah* and the *Lower Fardah*. The map in Figure (51) shows the canal networks serving both western and eastern quarters of Baghdad.

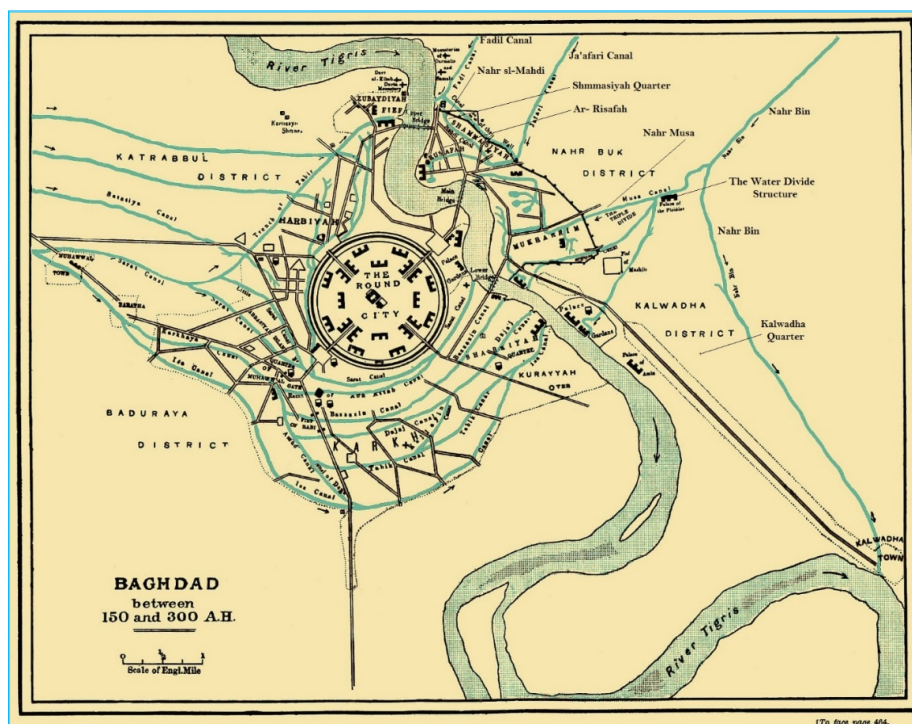


Figure 51: Baghdad map showing in addition to west Bagdad the Easter Quarters and the canal network serving both. East Baghdad Quarters were served from branch canals originating from Nahrawn Canal (8). (9)

Iskharti noted in his accounts on *Nahr Isa* and *Nahr Sarat*, that while barges could pass freely down *Nahr Isa*'s canal all the way from the Euphrates to the Tigris, the *Sarat*, on account of its weirs, dams, and waterwheels, was not navigable for large boats.

The Arabic word *al- Muhawwal* signified the place where bales are "unloaded," and so the town at this place appears to have received this name from the unloading of the river barges which took place here. Therefore, the cargo was carried over to the small boats that piled on the *Sarat* and *Karkhaya* in the reaches between the weirs. Furthermore, it would appear that these weirs kept the waters of the *Karkhaya* and its secondary canals to higher levels relative to the stream that flowed down the main *Sarat Canal*. As we have already seen a branch from the *Karkhaya* was carried across and above the *Sarat* by the arches of the aqueduct of a bridge, passing thence northward into the *Harbiyah Quarter*.

The contemporary writers made a special mention that the waters of the *Nahr Isa* never failed, nor was its channel was liable to become silted up. They describe it as flowing through the midst of the city, reaching the Tigris at the lower harbor. The arrangement of transferring the cargo at *al- Muhawwal* made of this town a very busy commercial station, and an important node on the canal system serving Baghdad and its suburbs. The town was a fine town, famous for its markets and its gardens, and as late as the 14th century possessed some significant buildings. The exact site of *al- Muhawwal* is not known, but it must lie to the north-east of the ancient

Babylonian mound called the Hill of “*Akarkuf*,” which is frequently mentioned by the Arab geographers ⁽⁴⁾.

Dealing with the question of drinking water supply of Baghdad, *al-Tabari* quoted other writers of how things were going about in solving this matter. LeStrange confirmed *al-Tabari's* account, whereby water was carried, in the beginning, on the backs of the pack- mules filled in leather bags of goatskin and delivered to the population and even to *al- Mansur* palace. Later on *al- Mansur* commissioned his uncle ‘*Abd- as Samad*, to lay a conduit to bring water direct from outside the *Khurasan Gate* to the palace tanks.

This work ‘*Abd- as Samad* successfully accomplished, making the conduits of teak wood (*Saj*), and the *Khalifah* improved on this by digging permanent watercourses from both the *Dujail Canal* and the *Karkhaya Canal* thus bringing a plentiful supply of water into the palace and other parts of the Round City. The beds of these new watercourses were laid in cement, and they were arched over throughout their whole length with burnt bricks set in mortar, so that during both summer and winter water never failed in any street or quarter in the city of *al-Mansour*.

Development of many new quarters around the Round City occurred rapidly after the construction of the city itself and the density of population in these new residential and commercial parts increased also, especially after *al- Mansour* had ordered the removal of the markets to *Karkh* outside the Round City. This led to the construction of the large network of canals and watercourses such as to penetrate

to all the living quarters and groves in *Karkh* (4). (9). Unfortunately, we have not received any account from the geographers and scholars who wrote on Baghdad telling us exactly which of these canals and watercourses were used to supply drinking water and irrigation water, and which of them were drains to remove the surplus water from the other watercourses. It is not possible that one canal can perform the dual functions and this will remain obscure unless some new findings would explain this matter (11).

Baghdad, soon after its establishment, and as usual for lively and prosperous cities grew in population and built up area, so it extended to occupy the left bank of the Tigris after *al- Mansur* had established there an encampment for the troops of his *son al- Mahdi*, and built a large palace for him and large Mosque. This new quarter was named *ar-Rusafah*, which was surrounded by a wall for its defense. This work opened the way for many influential people to build palaces, and for other people to build their homes and establish many markets (*Suqs*). The water supply to the eastern side of the city, however, was obtained from the Tigris River through tributaries of the *Grand Nahrawn* Canal, which originated from the Tigris River eastern bank downstream from Tikrit at the upper edge of *al-Sawad*. (More details on this canal, its tributaries and the dense canal network which supplied all the area east of the Tigris River, including east Baghdad will be discussed in details in the next chapter, but the map already shown in Figure (51) indicates those tributaries feeding east Baghdad in addition to the other network which were serving west Baghdad.

Now Leaving Baghdad and its dense network of channels and watercourses, and continuing down along the Euphrates, we come to the third large transverse canal called *Nahr Sarsar*.

This canal branched from the Euphrates at a point three leagues (about 15.5 km) below the village *Dimmima* already mentioned. Its course was in the direction towards the Tigris in a similar fashion as the other canals, and also poured into it at a point four leagues (19.2km) above Madain which was located on the opposite bank. According to Sousa, the course of *Nahr Sarsar* at that time was in the same direction that is followed by modern days Abu Gharib canal ⁽⁵⁾.

Nahr Sarsar canal, in its lower reach, crossed the *Baduraya* district which was south of west Bagdad. *Ibn Serapion* described the numerous waterwheels (*daliyas*) and levers (*Shadufs*) which were set up along its banks for irrigating the fields and orchards. This gives clear indications that the irrigated land in that part was higher than the canal water level. At a point some distance above *Zariran*, which was almost in sight of the white palace of *Khusraw* at *Madain*, this canal, poured out into the Tigris.

The flourishing town of *Sarsar* from which the canal took its name was located where the great bridge of boats carrying the *Kufah* road crossed the canal, and the town was about two leagues (about 10 km) only from *Karkh*, the southern suburb of west Bagdad. The canal as described by *ibn Hawkal* was navigable for boats, and the town stood in a forest of date-palms ⁽⁴⁾. According to the same scholar he described the land of *al- Sawad* between Bagdad and *Kufah*; that

it was crisscrossed by multitude of canals, and watercourses, which were fed from the Euphrates in such a way that it was difficult to distinguish these canals one from the other and the land that was served by *Nahr Sarsar* canal was no exception ⁽⁵⁾.

Following the same pattern of branching from the Euphrates, the next transverse canal was *Nahr al- Malik*, which began at the village of Falluja five leagues (24 km) below the head of *Nahr Sarsar Canal* and flowed into the Tigris three leagues (about 14 km) below *Madain*. *Nahr al- Malik*, or the “*King Canal*,” actually had existed from the times of the *Chaldeans of Babylon* or even before that and was specifically mentioned by the Greek historian Herodotus. On this canal he had said:

“Nahr Malcha; it is the largest Babylonian canal which ran to the east and could be navigated through by large ships”.

This description and other historian’s accounts show clearly that it belonged to the *Chaldeans* era of *Babylon*. Referring back to the description of the hydraulic works of the great *Chaldean* king *Nebuchadnezzar* given in Chapter 5, the following was stated:

“He excavated four canals across the land, to unite the Tigris and Euphrates. The width and depth of each canal were enough to carry merchant ships, and branching into a network of smaller canals and ditches for irrigating the fields. In order to fully control the increased mass of waters which he thus obtained, Nebuchadnezzar had created a huge basin or reservoir near Sippar on the left bank of the Euphrates by flooding the present day depression of Akarkuf, which

was according to the description of Herodotus some thirty- five miles in circumference and as many feet in depth, even though, other writers gave higher figures. Water was supplied to the reservoir by a very large canal which had existed already or re-excavated by Nebuchadnezzar. Stored water in the reservoir during flooding season was released to the Euphrates in the low water season. This canal was called “*Nahr Malka*” or the Kings River”.

This means that not only *Nahr Malik* was dug by the Chaldeans but all the other canals already described belonged to the Chaldean era” (12).

Yakut reported that tradition gave it that *Nahr al- Malik* as having been dug either by *King Solomon* or by *Alexander the Great*. The remnants of this canal are currently observed close to the present day *al- Radhwaniya* canal according to *Sousa* (13).

On the banks of this canal the town called *Nahr al-Malik* was located, seven miles south of *Sarsar*, and according to *Ibn Hawkal*, the town was a large and fine town, being, likewise, famous for its corn and palm groves. *Mustawfi* added to this that over 300 villages were of its district.

Nahr al-Malik town which was also called (*Daskarah*) was about five leagues (24 km) west of Baghdad, it was on the bank of *Nahr al-Malik* from which it took the name. It was dated to the pre Islamic era, and it was populated afterwards by Muslims and the Persians and Jews who had lived here before but converted to Islam after the conquest during the reign of *Khalifah ‘Umar*. *Nahr- al Malik*

town or *Daskarah* was famous for its great wealth derived from agriculture and animal husbandry, so the population worked either in farming and breeding cattle and sheep, or were traders exporting the surplus of all their products to other towns and villages. In one story attributed to *Yakut*, he had mentioned a man called *Dabes ibn Sadaka* as being such an important and wealthy trader and *Dahkan*, who had ordered his men to herd more than hundred thousand of his animals, presumably to be sold elsewhere. During the *Abbasid* times, this area was also used as hunting place by the *Khalifes* due to the abundant game that took a refuge in its thick groves (14).

The next major transverse canal, which was supplied by the Euphrates, was the *Nahr Kutha*, which had its intake at a point three leagues (about 15 km) below the head of *Nahr al-Malik*, and it poured into the Tigris ten leagues (48 km) below *Madain*. The *Kutha canal* watered the district of the same name, which was also known as the *Ardashir Babgan* district, after the first *Sassanid king* (224- 242 AD), though part of it was counted as the *Nahr Jawbar* district, which was watered from a canal branched from *Nahr al-Malik*.

On the banks of this canal stood the city of *Kutha Rabba*, with its bridge of boats, it was described by the 10th century *Ibn Hawkal* as a double city, *Kutha at-Tarik* and *Kutha Rabba*; and he claimed that the last was a city larger than *Babylon*. The first archaeologist to examine the site was George Rawlinson (1812 –1902) who had uncovered a clay tablet of king *Nebuchadnezzar II* of the *Chaldean Empire* mentioning the city of *Kutha*. Today the site of *Kutha* is marked by a

1.2 kilometer long crescent shaped main mound with a smaller mound to the west. The two mounds, as typical in the region, are separated by the dry bed of an ancient canal, and this site is called nowadays the Tell Ibrahim. The site was dug again in (1881) by the Iraqi archeologist and scholar Hormuzd Rassam (1826- 1910) for four weeks but little was discovered; mainly some inscribed bowls and a few tablets (15), (16).

A little to north of *Kutha Canal* stood the large village of *Al-Farashah*. On the half way stage between Baghdad and Hilla. *Ibn Jubayr*, who was here in (1184 AD), described it as the populous well-watered village, where there was a great caravanserai for travelers, defended by battlemented walls, and *Mustawfi* also gave *Farashah* in his itinerary, placing it seven leagues (about 35 km) south of *Sarsar*.

The excavation of *Kutha Canal* and the other aforementioned canals are attributed to the great *Chaldean* king *Nebuchadnezzar* according to the Greek historian *Xenophone* who described them as;

“being as wide as a hundred feet, and as so deep that they carry even corn ships, and for the construction of canals palm trees had to be felled all along their rout” (17).

Therefore, the whole area served by *Kutha Canal* was well developed much before the *Abbasid* time, and even earlier than the *Persian* era. The continued habitation and cultivation of the land for such a long period is a clear sign of its fertility and the continuous

mention of it in historical document is another indication of this important fact.

Below the *Kutha Canal*, at the lower Euphrates region, irrigation canals had a different pattern of spreading than those in the middle Euphrates, for these canals had to adapt to the continually changing river course, which was characteristic of this alluvial river here during history. The topography of the land between the Tigris and Euphrates had also its impact on having some of the major canals flowing into the swamps south of *Kufah*, rather than the Tigris, which was the case of the *Kutha Canal* and other major canals already, described.

The Euphrates River course had experienced many changes during history and one of the works of *Alexander the Great* during his stay in *Babylon* was solving the problem of the *Pallacopas* (described in chapter 6). This was to enhance the flood routing conditions of the Euphrates and solve the problem of the reduced water level in *Babil River* on which *Babylon* was located (Shatt al- Hillah of today). The *Pallacopas* however, had developed at a later stage into the major branch of the Euphrates (Shatt al- Hindiyah) on which *Kufah* was built just after the Islamic conquest. The same thing was experienced at the late years of the 19th century so it prompted the Ottoman Government to construct the Hindiyah barrage to solve the problem which had resulted in reducing the flow in the other branch (Shatt al- Hilla). This government had enlisted the service of the well known British engineer, Sir William Willcocks, who designed and oversaw

the construction of the well known Hindiya Barrage which was completed then in 1913 (18).

In the 10th century, however, the two Euphrates branches bifurcated at a point some six leagues (29 km) below where the *Kutha Canal* was led off. The western main branch, to the right, or the *Kufah* branch, presumably the old *Pallacopas*, passed down to *Kufah* poured hence into the *Great Swamp* in the manner that was meant to be in the *Alexander's* works, whilst the eastern branch, to the left, was called by *Ibn Serapion* and the other Arab geographers, as the *Nahr Sura*. This is the Shatt al- Hillah of today and the *Babil River* as it was called during the *Alexander* time.

From the upper reach of *Nahr Sura canal*, many areas were watered directly. These were the districts of *Sura*, *Bisama* and *Barbisama*, which formed parts of the middle *Bih Kubadh* district, then in continuing southwards the canal passed a couple of miles westwards of the city called *Kasr Ibn Hubayrah*. Here it was crossed by a great bridge of boats known as the *Jisr Sura* or (*Suran*) by which the pilgrim road went down from *Kasr Ibn Hubayrah* to *Kufah*. The town of *Al Kasr*, as it was called for short, meaning the *Castel or Palace of Ibn Hubayrah*, took the name, from its founder, who had been governor of Iraq under the *Umayyad Khalifah Marwan II*. Later on the first *Abbasid Khalifah al- Saffah* took up his residence here for a short time and called it *Hashimiyah* in honor of his own ancestor *Abu Hashim*, before he moved to *Anbar*. The *Khalifah al-Mansur* was also said to have resided in *Hashimiyah* before he moved to *Anbar*.

then to Baghdad, which he had built. In the 10th century, *Kasr ibn Hubayrah* or *Hashimiyah* was the largest town between Baghdad and *Kufah*, and it stood on a loop canal from the *Sura*, called “*Nahr Abu Raha*” or “Canal of Mill.”

At a point above *Babil*, the *Surat Canal* gave a large branch which flowed towards the Tigris and irrigated large tract of fertile land, and it was called the *Nahr Nil Canal* or the Shatt- al- Nile of today. *Ibn Serapion*, however, had called this canal in his writings as the “*Great Sarat*,” which should not be confused with the “*Sarat Canal*”, the other canal which irrigated Baghdad and mentioned earlier. It may be added that *Nahr Nil* waterway was the last of the group of canals, which emptied in the Tigris, and we shall discuss more of it after we follow the course of the main *Surat Canal* itself.

So the *Surat Canal*, after it gave water to *Nahr Nil* it continued in its course southwards and passed by the ruins of *Babylon* on its left, and then after few miles passed through the city of Hilla “the Settlement”, which was called then “*Al- Jami'an*” or the “two mosques”.

This town was a populous place, and its lands were extremely fertile. The town itself was built on the right bank by *Sayf- ad- Dawlah*, chief of *Bani Mazyad*, in about 1102 AD before it extended to the left side also. The city as geographers described it was surrounded by date palms groves and hence had a damp climate, and that it had quickly grown in importance, as it was located on the road from Baghdad to *Kufah*. As the *Surat Canal* continued down from *al-*

Jami'an (Hilla) for another six leagues (29km) and according to *Ibn Serapion* it bifurcated. The main right arm going south was kept the name of the main canal *Sura*, while the left arm was called *Nahr an-Nars*, which turned off to the south-east, this after watering “*Hammam Umar*” and other villages reached the town of *Niffar*. This canal took its name from *Nars* (or *Narses*), the *Sassanid king* who came to the throne in 292 AD. Both the *Sura Canal* and *Nahr an-Nars* poured their waters afterwards into *Badat Canal*, which traversed the north limit of the great swamp. The *Badat Canal* was a drainage canal which branched from the left bank of *Kufah* arm at a point one day journey north from *Kufah*, probably near the town of *Al-Kanatir*.

Nevertheless, going back to the *Nahr an-Nil*, the main branch of *Surat*, which was mentioned in the beginning; this branch continued to serve its purpose up to the present days under the name of *Shatt-an-Nil*. From its point of origin the *Nahr an-Nil Canal* or the “*Great Sarat*” flowed eastwards past many rich villages, throwing off numerous water channels and shortly before reaching the city of *al-Nil*, a loop canal, the *Sarat Jamasp*, branched from its left and rejoined the main stream below the town.

This loop canal had been re-dug by *Hajjaj*, the famous governor of Iraq during the *Umayyad Khilafa*, who was also the founder of the town itself, but the loop canal took its name, from *Jamasp*, the chief fire priest, who in ancient days had aided *Gushtaps* to establish the religion of *Zoroaster* in *Persia*.

After watering all the surrounding districts, *Nahr an-Nil Canal* came to a place called “*al- Hawl*” which was the lagoon near the Tigris opposite *Nu’maniya* where a branch called *Upper Zab* branched from its left side and poured its water into the Tigris. But the main course of *Nahr an-Nil* turned here to the south and flowed for some distance parallel to the Tigris down to a point one league (about 5 km) below the town of *Sabus* which lay one day’s march above *Wasit*. Here the canal finally discharged its waters into the Tigris. The lower reach of the *Nahr an- Nil* was known as the *Nahr Sabus* in reference to the town of *Sabus*, although some geographers had called this reach as the “*Lower Zab.*” *Yakut* in the 13th century reported that both canals had, however, gone much to ruin, though they bordered fertile lands (19).

From the foregoing, we learn that most of the *al-Sawad*, between the two rivers, even from ancient times, was irrigated mainly from the Euphrates. The ancient people of Mesopotamia made use of the flat topography of the land and its slope from the Euphrates in a southeastern direction towards the Tigris.

The Tigris in this whole reach acted as a drain; the only exception was south of Kut where the land below it sloped in southwestern direction. In this way, the major canals of the Euphrates were the arteries of the intensive canal networks that covered every piece of land in lower *Sawad* between the two rivers.

The Tigris River, however, was mainly the source of water for irrigating the lands on its left side as far as the foothills of *Persia*. The

Irrigation of this vast tract of land which extended from downstream of Tikrit to Kut was done by the *Great Nahrawn Canal* in addition to the Adhaim and Diyala Rivers which were acting in interaction with the *Nahrawn Canal* by irrigating lands above the *Nahrawn* canal course. Other canals from the Tigris; the *Dujail* and *Ishaqi*, also played an important role by irrigating the districts north of Baghdad directly from the Tigris. These canals and their related hydraulic works hydraulic works are discussed in chapter 9 and chapter 10.

The great canal systems were kept in good working condition to a late date during the *Abbasid Khilafa*. This was only possible as a result of the *Persians*, *Umayyads* and the *Abbasids* attention which they had paid to them. They knew very well that these canals were the source of most of the revenue on which their empire's livelihood depended; as without them agriculture could not flourish and give the abundance they had managed to have.

The land of Mesopotamia that was also called *al- Sawad*, as seen from historical records and archeological discoveries, was densely populated. *Babylon*, *Seleucia Ctesiphon*, *Basrah*, *Kufa*, *Wasit*, *Bagdad* and *Sammara*, were the large cities and capitals of Mesopotamia during its long history, and so they were the centers of trade and wealth of the successive empires that had dominated this land at their times. The main rivers and the network of canals supplied these cities with their needs of water. In the case *Basrah* and partially of Baghdad, dug canals supplemented the drinking water supply that was drawn from the rivers. Fortunately, the many manuscripts left to us by

the scholars and geographers, Muslim and others, are rich in the description and details of agriculture and irrigation throughout the ancient times and Islamic era.

The Arabic manuscripts describing *Basrah* and Baghdad canals and the other major canal networks of both Euphrates and Tigris were translated to English by western scholars since the late nineteen century and were published in the Journals of the Royal Asiatic Society of Great Britain and Ireland and the Royal geographical Society of London, and even in large volumes of books were written by travelers who inspected the remnants and ruins of these canals and provided great deal of details shedding light on these great works. One very important example, which is worth referring to, is the translation of *ibn Serapion* MS which was done and commented upon by LeStrange and published in (1895) ⁽²⁰⁾.

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The Abbasids and Tigris Irrigation canals

-The Nahrawn-

The Tigris River, in a similar way as the Euphrates, supplied Iraq's *al-Sawad* with abundant amounts of irrigation water.

The geomorphology of its valley as it entered the delta, however, controlled the way of how water was drawn from it and how irrigation was affected. The frequent shifting of its course during history had also its impact on the major canals off taking from it and the locations of these off takes. This was evident from the old history of the *Nahrawn Canal*, which branched from the left side of the Tigris, and the *Dujail* and *Ishaqi* canals branching from the right side of it.

The history of the great *Nahrawn Canal* is very old, and this was explained in chapter (3); it is thought, depending on archeological findings, that its origin went back to about 2000 BC. This great canal and its network of branch canals and watercourses continued, however, to serve its purpose until the decline of the *Abbasid Khilafa*, when due to negligence and lack of maintenances its conditions deteriorated; and in the following wars and conflict was destroyed and abandoned.

The *Nahrawn Canal* is known from its remnants today, and from historical writings, whereby it had branched from the Tigris River downstream from Tikrit, had taken a southeasterly direction and crossed the present course of al-Adhaim River upstream from the

confluence of this river with the Tigris. Whether it was itself, an old course of the Tigris River is something that needs an elaborate study and more archeological and geological investigations. In its known course, it continued to run in southeasterly direction for a long distance until it reached the Diyala River, where archaeological evidence indicates that the river, itself was diverted into many canals which served irrigation to the east of its course direction to allow the passing of the *Nahrawan* canal across it while its original course became a drain..

In total, the *Nahrawn Canal* extended for 225 km from its beginning above Sammara to the southeast of Baghdad at the outskirts of Kut, Figure (52)⁽¹⁾. One photograph taken of the remnants of the *Nahrawn Canal*, at a location south of Samarra by the well-known British Oreantalist Miss Gertrude Bell in 1909 is presented in Figure (53).

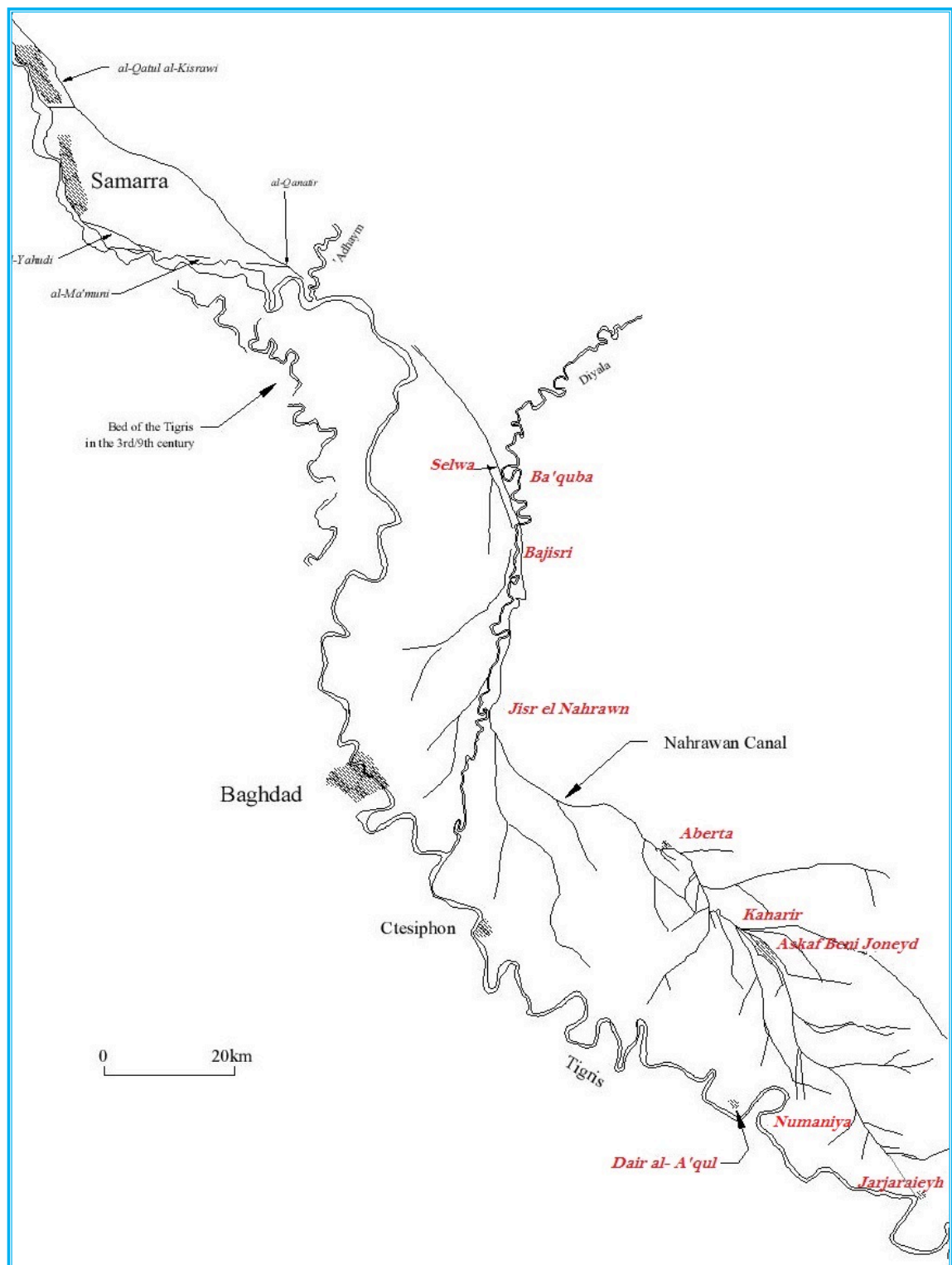


Figure 52: The course of the Nahrawn Canal ⁽¹⁾



Figure 53: Photograph of the remains of Al Nahrawn canal taken by the British Oreantalist Miss Gertrude Bell at one location south of Samarra in 1909, Bell (1909)⁽²⁾

This photograph shows the canal grandeur even after its abandonment and its decay since more than eight hundred years. To give as detailed an account of the long route of the canal as possible, it is endeavored here to do the following:

First: describe it from its point of origin all the way down to where it crossed the Diyala River at the old Diyala Dam site, a reach which many authors had given it different names, such as the *Upper Katul*, *Al Qaim* or the *Nahrawn*;

Second: follow the lower reach of the canal from the site of the old Diyala Dam site down to where it ended in the Tigris River close to *Jarjaraiyeh*. Some authors called this reach as the *Nahrawn*, but others called it *Tammara*; which was the old name of the Diyala River

itself. For our purpose, however, and to avoid confusion, the name *Lower Nahrawn*, or just the *Nahrawn* will be used.

Along this long route, many large distributaries had branched from the trunk canal to irrigate every piece of land in the vast area east of the Tigris helped with the flows of the Adhaim and Diyala Rivers, which irrigated the remaining lands not within its command. The course of the canal as illustrated in Figure (52) shows its extent and some of the major towns it served. The canal originally had two head reach canals before digging another upper one by the *Persians*, which was called the *Upper Katul*. Many impressive engineering works were also built to extend the service of the canal and cover most of the *Sawad* lands at the east of the Tigris River.

In accomplishing these works, the engineers had done many reconnaissance works and made use of topographical features such as depressions and older river courses in order to extend the canal for such a long distance. They had also thought of, planned, and executed all necessary works to ensure the canal continuity and flood relief works related to it, in addition to the vast irrigation canal networks covering all the lands that the canal had served along its long course. Judging from the size of this great work, it can be assumed that it must have taken tens, if not, hundreds of years to complete; and this accomplishment was made possible by utilizing the manpower of thousands of slaves and prisoners of war, that were normally taken in the big battles of those times. This indicates clearly that such works could only be done by the “Victorious”.

It is a well-known fact from the history of the *Nahrawn Canal* that, it was preserved in good working conditions during the *Sassanid* times and, except for very short periods during wars and disturbances. The *Sassanid kings* knew very well the value of the canal and the enormous income it contributed to their treasuries. Therefore, they saved no effort in maintaining its network of canals. The same applied to the *Khalifahs* of the *Abbasids* during the *Khilafa's* golden era, who contributed a great deal in its improvement and extension for the same reason. Unfortunately, however, it was progressively abandoned from the mid-10th century onwards; which mirrored the *Abbasid Khilafa's decline*. The canal, henceforth never had the chance to be revived by the foreign powers who occupied this land.

Geographers who travelled over this area in the middle of the 19th century witnessed to the fertility of these lands, as they observed this in the localities irrigated from the few small existing canals at this time. Otherwise, the vast remaining areas once been deprived from their irrigation supplies turned to barren and empty lands, mostly inhabited by the roving Arab nomads with their animals. Their sheep flocks, grazing at the meager grass that would grow after the rain showers of winter, or at best they grew grain in the deep beds of some short reaches here and there of the abandoned canal where the wetted earth had been soaked by the water pools left from these showers. Contrasting this bleak picture with the shining and lively one given by the Muslim Scholars of the 9th and 10th century, who described the greatness of the canal and wealth it bestowed on the population, one

cannot but feel sorry and sad at the same time of the turn of events that led to this situation. One would also wonder; was it a misfortune that the wealth of this region was always tempting invaders to reach for it? Or was it because it was a theater of conflicts between foreign forces who settled their accounts on it?

Indeed while all these were good reasons, the main ones actually were the indifference and slackness of the people themselves brought about by too much prosperity, which was the case in the late *Abbasid* period.

From the chronicles of Dr John Ross, a medical doctor who was attached to the British Residency in Bagdad, which were published in the Journal of the Royal Geographical Society in 1841, and were related to his journey in 1834 along the route of the *Nahrawn Canal* from Baghdad to Sammara; he gave a vivid description of what remained of this canal. He even spoke of the amazing fertility of one tract of land, originally irrigated by the canal, but was being irrigated then by the *Khalis Canal*, where he says:

“I never saw the effect of irrigation better marked than in this day’s march: as far as the branches of the Khalis are carried on both sides of the parent trunk, all is green, and the soil was remarkably rich, while beyond it, on either side, there is nothing but arid desert, entirely destitute of any vegetable production”⁽³⁾.

The head works of the great *Nahrawn Canal* were associated with another, very impressive engineering work; namely the “*Grand*

Nimrud Dam” which was located some kilometers below the spot where the Tigris entered its delta.

The massive earthen Nimrud Dam barred the valley, during much earlier times, and the river turned over the hard conglomerates, so that it could flow at a higher level and irrigate the country on both banks. In the words of Sir William Willcocks, the late nineteenth-century British engineer he sated;

“The construction of the Grand Nimrud Dam and the Great Nahravn Canal involved colossal volume of work and great deal of planning and surveying works. In considering the size of the “Grand Nimrud Dam”, we should remember that this dam had to be of such volume and workmanship as to resist Tigris floods which from hydrological calculation can reach up to 12000 m³/second. The dam continued to function for about three thousand years, and its destruction and progressive abandonment lasted from the mid-10th century onwards mirroring the Abbasid Caliphate's decline”

Sir William Willcocks, who had studied the irrigation of Mesopotamia for the Ottomans, also added:

“The Great Al- Nahravn Canal was the greatest and grandest of all irrigation canals of the ancient times that we know of today. It had extended for 300 kilometers and supplied water to an area of 80,000 square kilometers of irrigated land. Its discharge must have been between 250- 300 cubic meters per second. From the remains of the canal, it must have had a width of 120 meters in some parts and a depth of 12 meters” (4).

According to Willcocks, the *Nahrawn Canal* must have helped a great deal in the relief of the Tigris River floods.

In the description of *Ibn Serapion* of the *Nahrawn Canal* during the *Abbasid* time, he informs us that the canal branched from the Tigris at a point south of Tikrit, to the north of Sammara, a short distance below *Dur- al- Harith*, where the city of Dur exists today (see Figure (52)) .

Down to the place called *al-Qanatir (el Kanatir)* the canal was called the *Katul al-Kisrawi*.

Moreover, the canal had also two additional head reach feeder canals from the Tigris located south of Sammara for the obvious reason of providing the flow with the required command over the irrigated land during high flow and low flows seasons. These head reach canals, or *Katuls*, according to *Ibn Serapion*, had the names of *al-Yahudi*, which ran for a short distance before joining the second head reach feeder canal called *al- Ma'muni* to form the canal under the same name.

The *al- Ma'muni*, which passed many villages and fertile domains, finally met with the *Katul- al Kisrawi* below the village of *al- Qanatir*. One large weir was constructed at the confluence of the two canals which was called *Ash-Shadhurwan*, which was obviously built to raise the level of water in the canal for better command over the irrigated lands. Twenty kilometers below this point the town called *Sula* or *Salwa* was located (5).

A new feeder or *Katul* was dug later on by the *Khalifah Harun al-Rashid*, which was called *Abu- al-Jund*, and this canal was a very large canal, which had the best-cultivated land along its banks. Many distributaries branched from it and irrigated the lands laying a considerable distance to the east of the Tigris and even south of Baghdad.

From *ibn Serapion* writings, LeStrange ⁽⁶⁾ quoted the following:

“The third canal was called Abu- al-Jund (Father, or Supplier, of the Army) from the fact that the crops raised on the lands watered by it were used as rations for the troops. It was the largest canal of the three, and had been dug by Harun al Rashid, who built a palace there while superintending its construction”

Sousa, however, in his book on the irrigation of Sammara ⁽⁷⁾ speaks of different names of these feeder canals; the first feeder canal he called “*al- Qaim*” and the name of the second feeder “*el- Sanam.*” After the merging of these two feeders the main canal continues, according to him, bearing the same name of (*al- Qaim*) until it joins the *Katul Kisrawi* near *al- Qanatir* (Kanatir).

Dr Ross, however, wrote in his chronicle mentioned already, that the above names were the names used by the local people at his time, which explains why these were not mentioned in the writings of the 9th and 10th centuries Muslim scholars who wrote on the *Nahrawn Canal*. Dr. Ross presented also a sketch of the remnants of these feeders, which were mapped by him in 1834, Figure (54) ⁽³⁾.

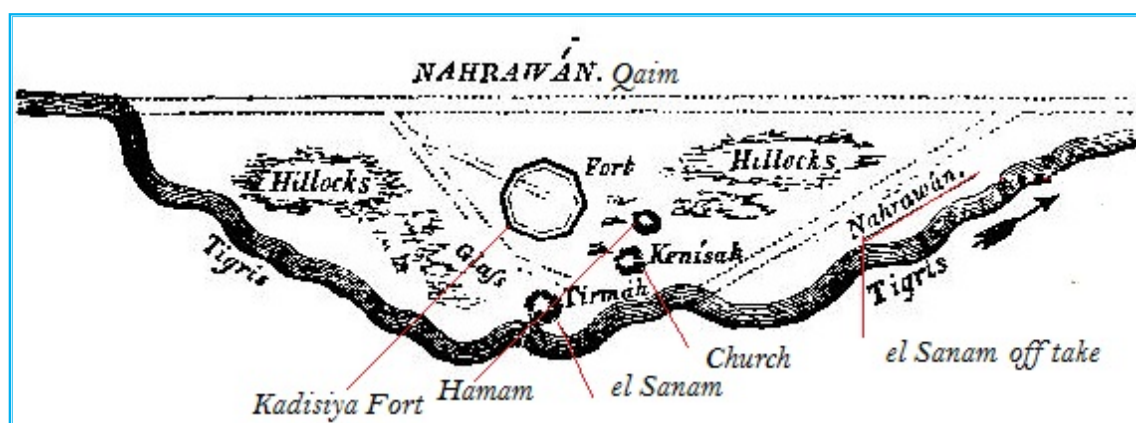


Figure 54: Dr Ross Sketch of the feeder canals of the Nahrawn Canal ⁽³⁾.

Dr Ross, in his description, which was based upon the narrative of his local Arab guides; the “*el Sanam*” off take was close to the location of an immense statue called by the locals (*el- Sanam*) or (*Idol*). The top of which was removed previously and taken to Baghdad by another British traveler called Colonel Taylor, but the lower half being buried under the ground was left in the place. A recent work performed by a British archeological expedition in surveying and digging up of Sammara archaeological sites and published in 2007 the same site was examined and surveyed, and the results are shown in Figure (55) ⁽⁴⁾.

On the courses of the *Katul Kisrawi* and the other feeders many masonry bridges of arches were built to facilitate the crossing of people and animals or passing the flow of one canal over another as aqueducts to irrigate more land on the other side. The people would have called these bridges and aqueducts properly as *Kanatir* at those times, while weirs, which may have also carried crossing over them would be called *Shadhurwans*.

According to *ibn Serapion*, the *Katul Kisrawi* assumed the name “of *al- Nahrawn* as it passed through the city of *Jisr al- Nahrawn*, but

it was named “*Tamarra*” just below *Ba’quba*, which brings again the problem of nomenclature mentioned earlier.

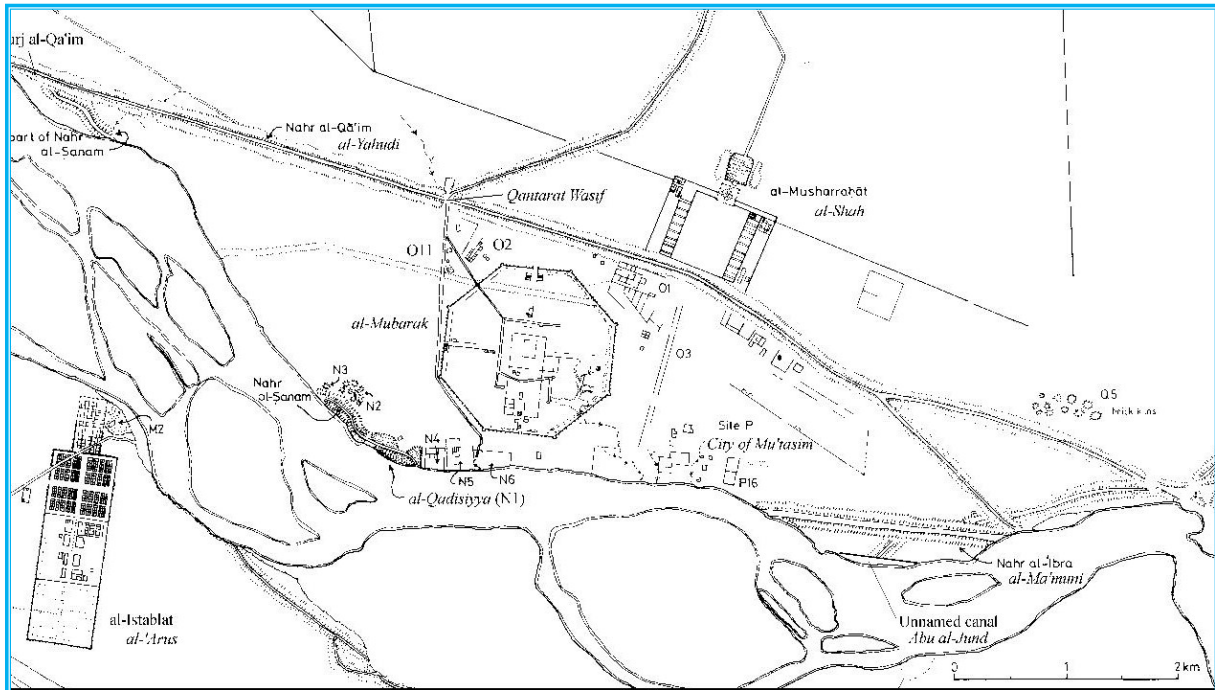


Figure 55: Area south of Nahr al Qaim showing el-Sanam feeder below it and the Qadissyya fort in between them (1).

Compared to the *Nahrawn* or *Tammara*, the *Katul Kisrawi* did not exist in the early history of the *Nahrawn Canal*, but it was excavated later by the Sassanid King *Kosrow Anushirwan* (531- 579 AD), so it was named after him as the “*Katul Kisrawi*,” while its remnants exist today under the name “*al- Russasi*”.

The “*Katul Kisrawi*” stretched from its intake on the Tigris just below al-Dur for 65 kilometers until its confluence with “*al- Qaim*” feeder canal forming the main *Nahrawn* canal or the “*al-Qaim*” as Sousa called it.

The dimensions of “*Katul Kisrawi*” were 20- 25 meters in width and 10- 12 meters in depth in the first 25 kilometers, then it widened to up to 100 meters with depth of 2-3 meters in the remaining reach.

After merging with the “al- Qaim” canal aforementioned, the combined canal widened even more.

The “*Katul Kisrawi*” irrigated all the lands extending below its intake, on the left bank of the Tigris and the orchards of the present city of “*Balad*.” These lands were densely populated and permanently cultivated and were called *Tusuj Bazerchsabour* (meaning Bazerchsabour districts). It is interesting to note here that, the administrative system used by the *Sassanids* for the purpose of land management, canal’s maintenance and tax collection, was also adopted later on by the *Abbasids* for the same purposes. In this system, the smallest administrative unit was designated by the name “*Rustaq*,” which covered few hamlets or small villages, then the “*Tasj*,” the plural being “*Tusuj*,” which contained many of the rural “*Rustaq*s,” finally, the area containing many “*Tusuj*” was called “*Kuora*” (8).

Available evidence indicates that the canal network for irrigate these lands used the summer discharge of the “*Katul Kisrawi*” completely. It was even necessary to construct one large weir or “*Shadhurwan*” just before its confluence with “*al- Qaim*,” very close to a large village called Al- Mamuniyya to raise the level of water in the canal during summer and get the required command for all the remaining part of the network. In many writings, this was also called the “*Upper Shaderwan*” to differentiate it from another similar weir that was called the “*Lower Shadhurwan*” on the lower reach of the canal at “*Aberta*.”

In 1849, Commander Felix Jones, who was employed by the East India Company, surveyed the location of this structure. Later, he conducted important archaeological surveys of parts of Mesopotamia, including the course of the *Nahrawn Canal*. His account of it was included in his detailed narratives, which were published in three articles that were kept in the records of the British Bombay Government ⁽⁹⁾.

Jones started his reconnaissance from Kut in April 1848 to look for and examine the remnants of the many branch canals that took off from the *Nahrawn* which irrigated the tract of land to the north and north east of Kut, and further to establish the route of the trunk canal itself south of the Diyala River. He then continued the reconnaissance of the course north of the Diyala River in March 1849.

Jones narratives are considered today to be very illustrative of the canal conditions in the middle of the nineteenth century, and they contained in addition description of the canal during its glorious times, basing this on the observations writings of the various Muslim Scholars of the 9th and 10th centuries who wrote on the canal.

In Figure (56), which is extracted from this publication, the confluence of the *Katul Kisrawi* and *al- Qaim* is shown, indicating the location of the “*Upper Shaderwan*” or weir.

A sketch of the same was given by Sousa in his book on the “Irrigation of Sammara” ⁽⁷⁾ which is also shown in Figure (57).

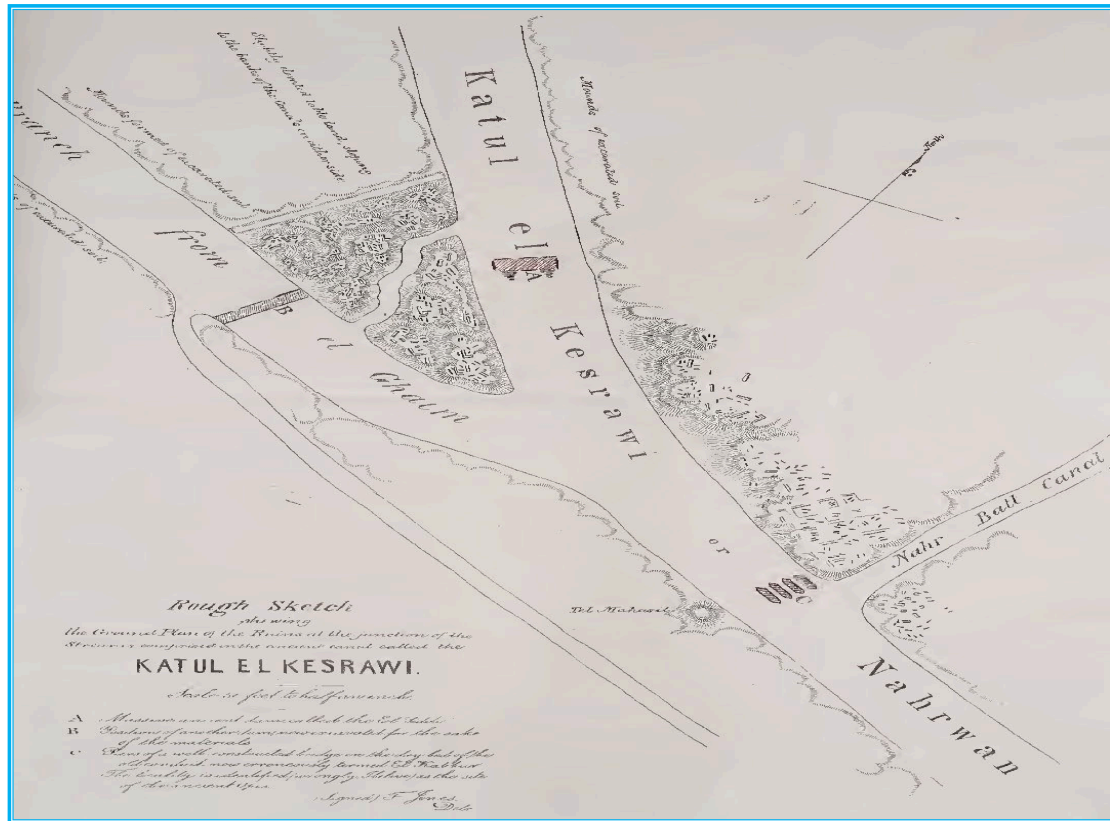


Figure 56: Sketch showing the confluence of the *Katul Kisrawi* and Ghaim (*Qaim*) as surveyed by Commander Felix Jones ⁽⁹⁾

Examining the site at the confluence of “*Katul Kisrawi*,” and “*al-Qaim*,” where this structure was located, Jones reported that, in fact there was a second dam on “*al-Qaim*”. This dam was located about a quarter of a mile above the spot where the two canals united. Apparently, it was destroyed, probably to use its material in building the nearby *Khan Dolojiyeh* town. The remnants of the structure indicated that it was of masonry construction built from very large kiln burnt clay bricks; these bricks were square shaped having a side length of sixteen inches, and four and half inch thickness. The length of the dam measured about ninety feet, and was some twenty feet in width. A sixteen, inches thick layer of very durable and of superior

quality concrete covered the surface of the weir. It was to protect it from the abrasive action of the current.

The two weirs were meant to raise the water level to feed the branch canals upstream when the main canal became too deep, and at the same time reduce the velocity of the flow protecting, therefore, the canal bed from scouring, and the bridge weirs downstream from abrasion.

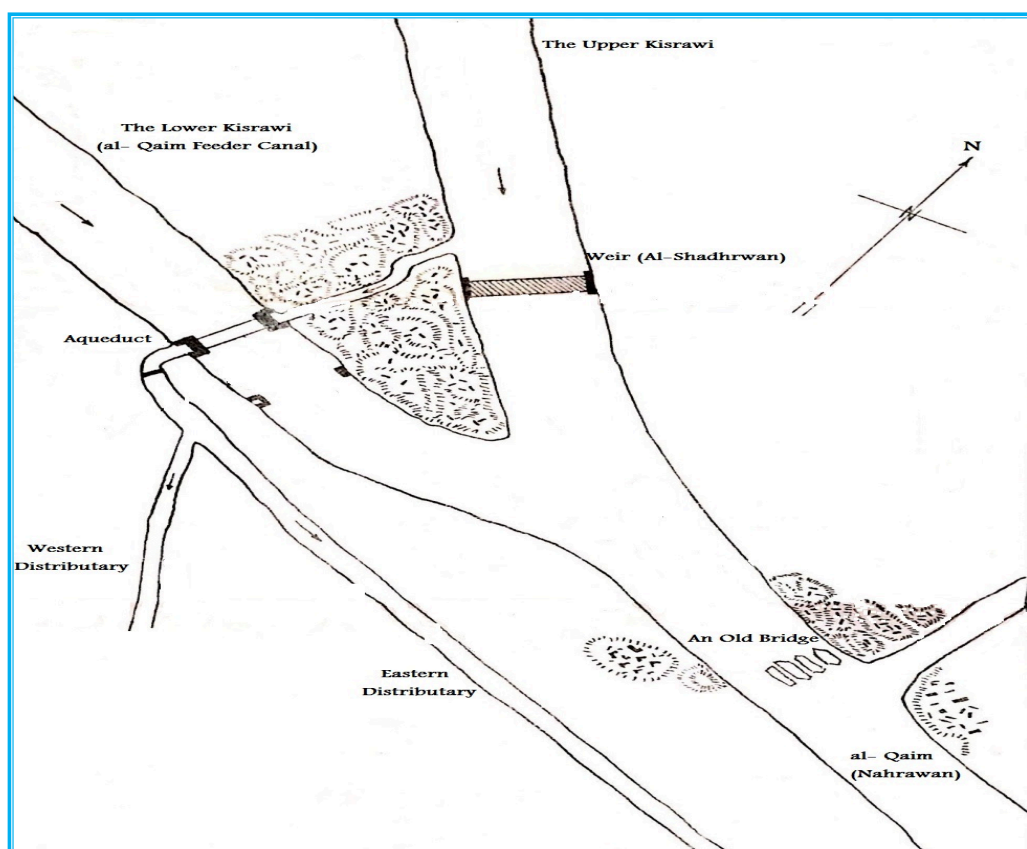


Figure 57: Sketch made by Felix Jones (1846), and modified by Sousa, of the remains of the Weir and other features at the confluence of the Upper Katul and *al-Qaim* Canal (nomenclature is translated from Arabic to English by the writer).

Opposite the location of the bridge, on the left side of the *Nahrawan*, there Jones took note of a mound called by his Arab guide “*Tell Mahasill*.” He thought that this was either a landmark for the

caravans seeking the crossing location, or maybe it was covering the ruins of a tall building that was used as customs or toll house.

From the extensive ruins between the two arms of the canal, which extended to fair distance, upstream Jones argued that these ruins may have belonged to the ancient city of *Opis*. However, historical evidence shows that Jones was wrong. *Opis* was an Ancient *Babylonian* city on the right bank of the Tigris. *Akkadian* and *Greek* texts had also indicated that this town was located on the west side of the Tigris near its confluence with the Diyala River. The precise site of the city has been considered uncertain for a long time. Recent geographical surveys of ancient Mesopotamia identify *Opis* with great probability as the mound called “*Tell al-Mujailāt (or Tulūl al-Mujaili`)*” which is located thirty-two kilometers southeast in a straight line from central Baghdad very close from *Ctesiphon*, and seventy-six kilometers northeast in a straight line from ancient *Babylon*. One more error seems to have been made by Jones; for in Figure (56) the left hand side branch canal he had called “*Nahr al Batt*” canal, while “*Nahr al Batt*” canal actually branched from the right hand side of the *Nahrawn* at a further point downstream, which corresponded to the site of the *al-Adhaim* dam;. Sousa seemed to have been aware of this mistake and so he did not attach any name to this branch in his sketch shown in Figure (57).

In the older history of the *Nahrawn* canal, and as mentioned already the third and uppermost feeder canal, namely, “*Katul Kisrawi*” did not exist, but it was dug later on by *Kosrow Anushirwan*

to irrigate more lands, which were located above the *al-Qaim* feeder canal. This action led to the reduction of flow at the lower reaches of the canal. As the “*Katul Kisrawi*” was drawing more water in summer, which had caused the lowering of the Tigris River water level upstream the *al-Qaim* feeder canal and deprived it from much of its original discharge during this season. Shortage of irrigation water was very severe in the districts around where the eastern quarters of Baghdad were built later on. Prompted by the complaints of the farmers of the affected districts, Anushirwan closed the intake of *al-Qaim* completely and dug a new canal to the south of it which was called in the Arabic literature by the name “*al-Qawrach*” (10). The exact location of this canal intake below *al-Qaim* is not exactly known; but the Tigris River may have obliterated its remains when it changed its course later on towards the east.

It is estimated, however, that it could have been at a point ten kilometers northwest of the present city called Balad. The course of *Al-Qawrach* traversed then a distance of about eighty kilometers until it joined the *Nahrrawn* canal. Along this course, many distributaries and watercourses had branched from it to irrigate the lands on the left of the Tigris, which were irrigated previously from by *al-Qaim*. From the large number of these watercourse's records mention some of them such as *Khait Ahmad*, *al-Mansur*, *Khait Abi Jarad*, *Khait al Majbura*, *Nahr Al jath*, *Nahr Abi Rumail* and many others.

Later on, during the *Abbasid* time, the Tigris River shifted its course as mentioned occupying the upper reach of “*al-Qawrach*”

itself, which caused the shifting of the canal intake downstream for about fifty kilometers. In this new location, the new intake began to draw excessive quantities of water during the floods of the Tigris River causing the frequent inundation of the area east of Bagdad, and endangering the eastern quarters of the city itself. For a solution, the *Khalifah Haroun al- Rashid* (786- 806 AD) ordered the closure of the intake of “*Al- Qawrach*” canal and the reopening of the closed intake of the “*al- Qaim.*” At the same time, he saved no effort in dredging the canal from the old silt accumulated in it previously and improved its course, and so it became to be known as “*Nahr abu- l- Jund*” as mentioned earlier.

For all these times, the *Nahrawn* canal remained the main source of irrigation water for the vast tract of *al-Sawad* lands in the eastern side of the Tigris River all the way from Tikrit to Kut. The establishment of Baghdad, the capital city of the *Khilafa*, at the heart of this area gave the canal more weight, as it became at the focus of the *Khalifahs*’ attention.

After the building of the round city by *al- Mansur*, the eastern quarters of Baghdad started to develop rapidly on the left bank of the Tigris. These quarters were supplied by water from the canals which branched from the *Nahrawn* in a similar way as the canals from the Euphrates supplied the round city and the western quarters of Baghdad.

The start was after *al- Mansur* had decided to leave his palace in the Round City and lodged in his new palace “*al Khuld*” which he had

built just outside the Round City very close to the bridge taking the *Khurasan* road across the river on the left bank. He at the same time undertook the building of “*ar- Rusafah*” on the eastern bank, exactly opposite to “*al Khuld*” palace. The “*ar- Rusafah*” included a grand palace for his son “*al- Mahdi*”, spacious gardens, large park, and a military camp for *al- Mahdi*’s troops with their review ground (*Maydan*); at this time “*al- Mahdi*” and his troops had just returned from *ar- Rayy* in *Khurasan* in 151AH/ 769 AD and they were in need for such an encampment. A protective wall and a moat surrounded the site of al-Mansur’s heir and an important military site, “*ar- Rusafah*”. Its suburbs outside the wall grew quickly as people began to move in especially the nobles who started to build new palaces and the commoners who found room for building their homes. These suburbs were “*al-Shammasiyah*” to the north, and “*al-Mukharrim*” to the south. All the three quarters became the forerunners of the modern city of Baghdad.

The small village “*Kalwadha*” south of “*ar- Rusafah*,” where “*al- Karada*” quarter of modern Bagdad is located nowadays, also flourished.

The Round City remained the seat of government until *Khalifah Mu`taşim* moved it to Sammara in (836 AD) which remained as the official residence of the *Khalifah* until (892), when *al-Mu`tadid* re-established Baghdad again as the Capital. In *al-Mu`tadid* reign the seat of *Khilafa* was fully established in “*ar- Rusafah*,” on the eastern bank of the river and so, “*ar-Rusafah*” and its suburbs grew to rival

the Round City with its increased population and many grand palaces, mosques, and markets.

The lands of *al-Sawad* east of Tigris had been under irrigation from the *Nahrawn* canal branches since the *Sassanid* times and even before, therefore, two of these branch canals namely *Nahr Khalis* and *Nahr Bin* had covered the requirements of the lands around the eastern quarters of Baghdad and the city itself before they poured out into the Tigris River. *Nahr Khalis`* intake was probably at a point near the town of “*Bijisri*” on the *Nahrawn* close to “*Ba`akuba*”. It flowed then a considerable distance before it poured into the Tigris at *Rashidiyah*, a short distance above *Baradan*, which gave one of the city gates its name and was located about three leagues (14.5 km) to the north of Baghdad.

Nahr Bin, on the other hand, bifurcated from the *Nahrawn* Canal at a short distance from the bridge of boats at the town of *Jisr al-Nahrawn*, and flowed out into the Tigris about two leagues (9.7km) below Baghdad at “*Kalwadha*”.

One important branch of *Nahr Khalis* at its lower reach was called the “*Nahr-al-Fadhl*” supplied a network of watercourses covering the needs of “*ar- Rusafah*” and “*al-Shammasiyah*” quarters before it ended in the Tigris River.

The watercourses bifurcating from *Nahr-al-Fadhl* assumed different directions passing between the gardens and palaces at these quarters, ending either into the “*Nahr-al-Fadhl*” itself or into the Tigris. The first of these watercourses was called “*Nahr-al-Ja`fari*”

whose point of origin was at some distant north of *Shammasiyah Gate*. Then after it had run passing many villages and irrigating the tract of land north of the city its water was dissipated completely, but not before it had given out an off shoot canal, which was called *Nahr al- Sur* (the canal of the wall). This new watercourse flowed along the wall of the city and passed the gates called “*Bab Khurasan*” and “*Bab- al Bardan*” before it poured out back into the *Nahr-al-Fadhl*, which itself flowed out into the Tigris at the gate of “*Bab- ash-Shammasiyah*.”

The next canal, which bifurcated from “*Nahr-al-Fadhl*,” very close to *Shammasiyah Gate*, was called “*Nahr al Mahdi*,” which having passed this gate, it entered Baghdad by “*Bab –ash-Shammasiyah*” and flowed to the market called “*Swaykat Ja’far*”. Emerging from “*Swaykat Ja’far*” this canal passed then by the road of *Nahr Mahdi* until it reached the bridge called “*Kanatir- al- Bardan*” whence it entered the House of the Greeks or “*Dair- al- Rumiyyin*”. From here it passed the market called the “*Suwayka Nahr- ibn Malik*”; and next entered “*ar- Rusafa*”, where it came to the Great Mosque, and to the garden called “*Bustan Hafs*” where it finally ended into a tank (*Hawdh*) located in the interior of the palace of “*ar- Rusafa*.” One watercourse branched from *Nahr al Mahdi*, which passed then in the “*Market of Nasir*” at the Iron Gates “*al- Abwab –al- Hadid*”; it flowed along the center of the road of the *Khurasan Gate*, flowing finally into the *Nahr as-Sur* aforementioned.

Two more watercourses branched of the *Nahr al Mahdi* itself, which made a loop before they met again. All these channels subsequently poured the remaining part of their flow back into the *Fadl Canal* itself. Therefore, *Nahr Fadhl*, which had originated from *Nahr Khalis* and its network were responsible for supplying *Rusafah* and the *Shammasiyah Quarter* with their water requirements.

The second main canal, “*Nahr Bin*,” that branched from *Nahrwan*, as already mentioned, headed in the direction of east Baghdad also. It flowed parallel to the *Nahrawn* for some distance after the bifurcation point then turned in a southwesterly direction towards the southern parts of the City.

One large stream called “*Nahr Musa*” branched from the right bank of “*Nahr Bin*” canal and ran some distance before it entered and irrigated the gardens of “*Ath-Thurayh palace*” (*the Pleiades*). This luxurious palace was built by the *Khalifah Mu’tadid* (854-902) at some distance outside the walls of east Baghdad. Coming out of the palace gardens, “*Nahr Musa*” passed out to an impressive structure known as the “*Water Divide*.” Here it was divided by this hydraulic structure into three streams; the first stream, or the western branch, had the longest course of the three and retained the name of “*Nahr Musa*” which continued on and passed to “*Bab- Suk- ad-Dawabb*” or “*The gate of the Beasts-of- Burden*,” and thence went across the gate called “*Bab Ammar*.” Here there was taken from it one watercourse, which passed the palace known as “*Dar- al-Banuja*”; and there it disappeared. “*Nahr Musa*,” however, passed on after traversing the

“*Bab- Suk- ad-Dawabb*,” and came to “*Bab – Mukayyar- al- Kabir*,” which is translated as the “*Great Pitched Gate*.” At this point one branch bifurcated from it and headed towards (the house of) “*Dar Ibn – al- Khasib*”, on the road called after “*Sa ‘id-al- Wasif*.” The branch continued from there to the market of “*al- ‘Allafin*” where it supplied part of its water to one watercourse, which had been dug by *al- Mu ‘tadid* to get water for his lake. The remainder passed to the “*Bab- Suk- al- Ghanam*” (the Gate of the Sheep market), thence continued behind the wine shops back toward to “*‘al- ‘Allafin*” which was known as the road of “*Bab- al- Mukharrim*.”

This branch passed under (the Bridge called) “*Kantarat- al- ‘Abbas*,” at (the Gate called) “*Bab- al- Mukharrim*,” and flowing along the road to *al- Mukharrim* quarter it then disappeared.

Now from “*Bab – Mukayyar- al- Kabir*,” “*Nar Musa*” went on to the bridge called “*Kantara-al- Ansar*”; and here there were taken from it three watercourses. The first of these flowed into the tank (*Hawd*) of the Ansar; the second into the tank of *Haylana*; and the third into the tank of *Daud*.

In this long course “*Nar Musa*” after giving out those three watercourses at “*Kantara-al- Ansar*” continued on to the road called “*Darb- at- Tawil*,” and the palace of *al- Mu ‘taşim*.

Here one more watercourse was taken from it to the market of “*Suk- al-Atsh*” and after flowing along the road called “*Karm-al- ‘Arsh*” it finally disappeared into the *Dar or* (House of the) *Wazir ‘Ali- ibn- Muhammad- ibn- al- Furat*.

The main stream of “*Nar Musa*” itself went around the palace of *al- Mu ‘taşim* and continued into the Great Road. Next, it came to the road of *Amr– ar- Rumi*, and then irrigated the garden called “*Bustan al- Zahir*,” and finally it poured out into the Tigris below this garden; some distance towards the south of the bridgehead.

From the “*Water Divide*” where the *Nahr Musa* was split, as explained already; the second canal called the “*Nahr- al- Mu’alla*” started. This name was taken after *al- Mu’alla*, a freedman of *al- Mahdi*, and a famous army general under *Harun- ar – Rashid*, who also held many important government positions such as the governor of *al-Basrah*, *Faris*, *al- Ahwaz*, *al- Yamama* and *al- Bahrayn*. The canal flowed towards the (Gate called) “*Bab Abraz*” and there it entered Baghdad. It took a course between the houses to the “*Bab- Suk-ath-Thulatha*” or “*Gate of the Tuesday Market*.” Next it entered the Palace of *al- Mu ‘tadid* which was called “*Al- ‘Firdus*” (Paradise), and after passing through it flowed into the Tigris near this palace.

In the various accounts of the Muslim scholars who wrote about this subject, no name was found for the third or lowest canal, which came out from the *Divide Structure*, but for convenience, it may be called the *Canal of the Palaces*.

This canal, flowing out of the *Divide*, had headed south, where it watered the grounds of the two palaces of the *Khalifahs*, called respectively “*Hasani Palace*” and “*Taj Palace*” or the “*Crown Palace*,” which justify calling it the *Canal of the Palaces*. Continuing from there it finally poured into the Tigris, immediately below the *Taj*

Palace (5), (6), (11). The map in Figure (58) shows all the quarters of Western and Eastern Bagdad during the period 772- 922 AD which corresponds to 150- 300AH.

On the description of Bagdad in the late 9th century the Muslim Scholar *Al-Ya'qubi* said:

“Here the weather thus becomes balanced, the soil is good, the water is sweet, the trees thrive, the fruits are excellent, the seed- crops flourish, the excellent things (of the earth) are plentiful, and tapped water is near its source. Because of the equitable climate, the fertility of the soil, and the sweetness of the water, the character of the people is good. Their faces shine and their minds are opened, so that they surpass all other people in learning, understanding, refinement, perception, common sense, commerce, crafts, and business” (12).

The main irrigation watercourses of Baghdad and the palaces of the *Khalifes* are shown in Figure (58); whereby five of these Palaces were located in the western Quarters, and seven more in the eastern Quarters making a total of twelve. Even today, such number of Royal Palaces remains unmatched in any other capital around the world, which can only mark the extravagance of the *Abbasid Khalifes*.

The same map shows that the whole environs of Baghdad (both the *Round City* and the *Karkh* in the Bagdad –West, and *ar- Rusafa* and the other quarters in Baghdad -East) were not irrigated directly from the Tigris which passed through. It was from canals originating from the Euphrates and Tigris off taking from the two rivers at quite some distance north from Baghdad. This indicates that the city was

higher than the river in normal flows, and the required command was only obtained by this arrangement, which reminds us of *Nineveh* and the *Sinnecharib* water schemes bringing water to the city from upstream locations and irrigating its gardens and parks by gravity while river Khosr (*Tebitue*) penetrated the city at a deeper elevation.

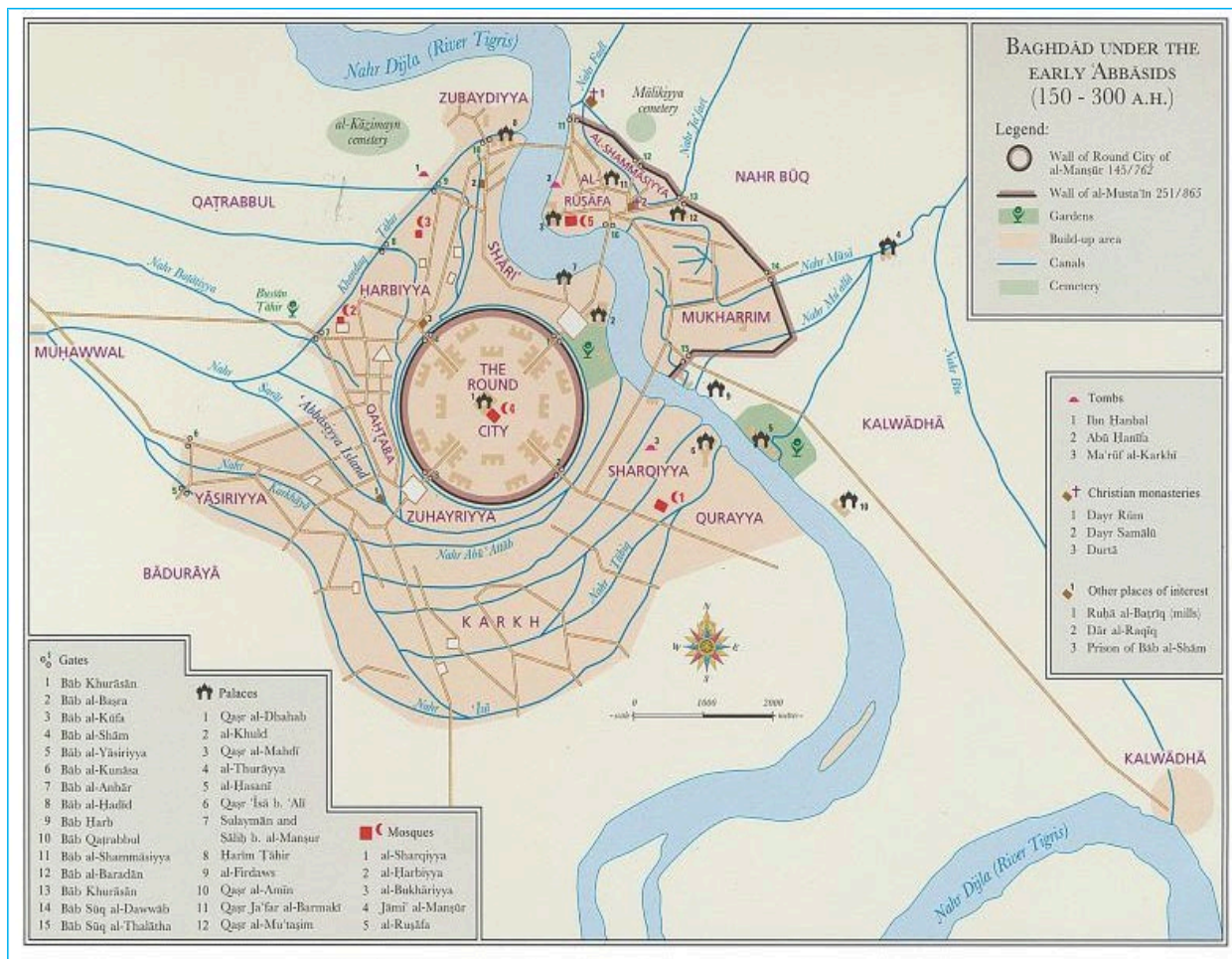


Figure 58: Map of Baghdad in (150- 300 AH), corresponding to (772- 922AD) (12).

Going back to the course of the *Nahravn Great Canal*, its upper part, which had extended from the three points of origin down to *Ba'quba* did not only irrigate all the *al-Sawad* lands east of the Tigris from Tikrit to *Ba'quba*, but it also supplied the eastern quarters of

Baghdad with all its needs of water as explained. The remaining *al-Sawad* lands from *Ba'quba* down to Kut were also irrigated from the lower reach of this canal and its numerous distributaries off taking from it, which had in this case supported life in the many flourishing towns and settlements, scattered along its course and became the lifelines of these towns.

In very illustrative words, Felix Jones, who traversed the land of *al-Nahravn* in his two reconnaissance journeys in April 1848, and later on in March 1849, he said;

“Of the early history of al-Nahravn, nothing much is known to us, but the repairs, improvements, and extensions were surly attributed to the Persian King Khosrau Anushirwan, and the canal must have attained the height of its celebrity and usefulness during the time of King Khosrau Parwiz. On its banks an agricultural and warlike population had erected villages and towns, and at convenient distance its stream was spanned either by masonry crossings or floating bridges. The adjacent country, plentifully irrigated by lateral cuts from either side of the trunk stream, abounded in date- groves and other trees that lent their shade to the traveler, for its course was then the high road that led to the south-eastern districts. Expansive fields, that exhibited a perennial verdure, must have moderated in some measure the torrid heats that are now felt, by protecting the soil from the burning suns, these fields, studded with the habitations, with the flocks and herds, of the semi- agricultural people. Semi- pastoral

community, must have rendered the country, from whence, it indeed, derived the greatest portion of its stupendous revenues ⁽⁹⁾.

This narration by Jones, although describes the greatness of this engineering work, seemed to neglect the great works of the *Abbasids*, who had not only improved and maintained the canal, but also had extended it beyond the boundaries of the *Sassanid* works. This can only be explained by the author's lack of knowledge of the writings of the Muslim Scholars of the ninth century who wrote on these achievements.

In a recent work published in 2007, the author of this work stated that the developments of the *Abbasid* period had obscured the earlier agricultural system of the *Sassanids* which can only be interpreted that the *Abbasids* works surpassed those of the *Sassanids* ⁽¹⁾.

The great canal had also its bad times during the *Sassanids* period, being so close to the scenes of the conflicts between the *Sassanids* and *the Romans*. For in 627 well after the reign of *King Khosrau Anushirwan*, the *Byzantines* under *Heraclius*, launched a winter offensive into Mesopotamia, and defeated the *Persians* at the Battle of *Nineveh*. In their progress south along the Tigris they were only prevented from attacking *Ctesiphon* by the breaching of the canal and destroying the bridges across it by the *Sassanids* themselves.

Just after the Islamic conquest of Mesopotamia, the province began to have a new revival at the hands of the Muslims. The building of Baghdad by *Khalifah al- Mansur* in the vicinity of the *Nahrawn*

had also conduced to the repair of the canal and its return to its original state and usefulness so that, during the golden reign of the *Khalifah Harun al Rashid* the canal contributed tremendously to the growth of the revenue of the treasury.

James Felix Jones of his first reconnaissance survey of the canal gives interesting narratives. He had begun from Kut on the 21st April 1848, and reported that he started by examining the tract of land at the north and north east of Kut to prove that much of the land here was irrigated from the *Nahrawn* distributaries and networks and to locate where the main stream of the canal itself had dissipated itself. For the first few days he moved with his Arab guides and muleteers along the Tigris River northwards from Kut towards the ruins of *Jumbil*, known in the Arab manuscripts by *Jebel*, and from here returned back to Kut after identifying some old small canal's courses, which must have been supplied from a branch canal belonging to the *Nahrawn*. He then moved from Kut in a northeasterly direction towards the depression called *al-Shuwaicha* or sometimes known as *Bahr el-Ruz* at short distance from Kut.

Always this marsh had caught the water coming from the wadis in Iran and crossing to Iraq, and to which the excess waters from the tails of the *Nahrawn* canal branches drained. From *al-Shuwaicha* heading, eastward towards Badra and Jassan seventy kilometers east of Kut and back towards the Tigris, the remnants of some large canals were encountered, which could have emanated from the *Nahrawn*. These were named by the local Arabs as *Mukta el Subba*, (the *Lion's*

Cut), *Gathir el Rishadeh*, and *Abu Chellach*. The last one headed towards the Tigris east of Debuni peninsula about thirty kilometers north of Kut.

From the descriptions of the Muslim scholars, the *Abu Chellach* turned to be the final reach of the *Nahrawn* main trunk, which poured into the Tigris between the ruins of *Jarjaraiyeh* and the head of *Shaour* canal.

Jarjaraiyeh was described by *Yakut* who wrote in his *Mu'jam al-Buldan* describing it as:

“It was a flourishing town which belonged to the lower Nahrawn districts between Wasit (Kut) and Baghdad on the eastern side, but became ruins when the Nahrawn and its branches were ruined” (13).

He added that from this town many learned persons, poets, writers and ministers had come (13).

In an earlier part of this chapter, the upper part of the *Nahrawn* or the *Katul Kisrawi* was followed till the off take of *Nahr Bin*, which supplied *Nar Musa* with water at the *Divide* and continued its way to *Kalwadha* south of Bagdad where it ended into the Tigris (Figure 58). *Nahr Bin* offtake was located probably at a point near the town of “*Bijisri*” below “*Ba'akuba*” by about six kilometers. The name of this town was mentioned by many Muslim scholars as it was situated on the important *Baghdad- Khurasan* road. *Yakut* described it in his “*Mu'jam al- Buldan*” as:

“ a small busy town to the east of Baghdad at a distance of about two days journey (ten Parasangs) from it, with large population and lot of palm trees, and good place for picnics ” (14).

The *Nahravn* canal itself above *Ba'quba* had crossed the Diyala River and ran parallel to it at the left side. This crossing was made possible by the construction of the *Old Diyala Dam* which diverted the flow of the river into a number of canals that ran out irrigating the area to the east of its course and finally draining into the *al-Shuwaicha* marsh close to Kut.

At “*Bijisri*” ruins, there are indications that the *Nahravn* canal had one connection with the old course of the Diyala River; this connection was in fact, a flood escape channel, which emptied the excess water during floods from the *Nahravn* into the old course of the Diyala River which had become a drainage canal.

The location of the *Old Diyala Dam* site was just downstream from where the Hemrin Mountains range crossed the river at “*Mansouriat el Jebal*.” It is believed that this high masonry dam had regulating sluices so that any excess water of the Diyala River floods would be released into the *Nahravn Canal* which would in its turn pour it back into the old river course at *Bajisri* as already explained. The *Nahravn*, therefore, was acting here as flood relieving channel, which could pass this extra water down to the dry course of the Diyala River at “*Bijisri*.” The *Nahravn* itself continued in its planned course at the left side of the original Diyala River and close to it until it, finally it poured into the Tigris at “*Jarjaraiyeh*”.

This may explain why many scholars mistakenly had called the lower reach of the Nahrawn by the name “*Tammara*” which was the original name of the Diyala River itself. In 1968, a new weir was built on the Diyala River near to the location of the old dam site, and it was called the Diyala Weir. The purpose was to organize the head works of all the canals that were supplied originally by the *Nahrawn* canal, including the *Khalis Canal*, but which after the collapses of the old dam were supplied again directly from the Diyala River.

It is worthy to mention that one large earth fill dam was constructed also upstream of this weir, which was completed in 1980. A provision was made in the left hand side dyke of the dam to have one section of it removed by blasting in case the safety of the high dam was threatened by large floods, so that a large portion of the storage would be released to the Ruz low lands leading to Suweycheh depression.

In the days of the old *Nahrawn* canal, Diyala River course remained as a drain collecting the irrigation water surcharge overflowing from the networks to the east of Baghdad, Figure (52). From the *Nahrawn* downstream of “*Bijisri*,” there branched many distributaries forming the dense networks of canals, which irrigated the domains at its left side down to the outskirts of Kut.

The next town on the *Nahrawn* canal downstream from “*Bijisri*” was about thirty-five kilometers away and it was called the “Jisr el Nahrawn” (Bridge of Nahrawn) often, abbreviated by just “*al-Nahrawn*” only.

This important town was located about one hundred and twenty kilometers distance measured along the canal from its off take at *al-Qaim* and twenty kilometers northeast of Baghdad. The name of the place where the ruins of this very famous and flourishing town are seen today is *Sifweh*. ”

Here the tomb of a man bearing the same name can still be seen, and it is alleged that it belonged to the *Kadi* (Judge) of the former town of *Nahrrawn*. The word “*Jisr*” referred to the pontoon bridge that connected the two banks of this town and remnants of the canal here measure about one hundred and seventeen yards making the use of pontoons for the bridge necessary.

According to *al-Tabari*; the bridge had more than twenty pontoons and was still in existence until it was burnt together with the town by the *Seljuk* troops led by *Mohammad ibn Babik* who were fighting another faction ⁽¹⁵⁾. From his description of this particular event, it may be concluded that this had happened in the early years of the eleventh century during the domination of the *Seljuks* over the *Khilafa*. *Yakut* the other Muslim Scholar, in his “*Mu’jam al-Buldan*” quoted *al-Asbahani* (948- 1038) of saying:

“the name “*Nahrrawn*” referred to a very long stream that irrigated great number of villages before it poured in the Tigris south of *Madaiyn* (*Ctesiphon*) and having two names; The first was Persian: *Jurawan* but the Arabs changed it to *Nahrrawn*, the second was Syriac and was *Tammara*” ⁽¹⁶⁾.

The town of *Nahrawn* was mentioned in *Ibn Hawqal's* book "*Surat al- Ard*" or "*Face of the Earth*," written in 977 AD where he described it in the following passage:

"A little town that was split into two halves by Nahr el Nahrawn; abundant of crops, full of date palms, vines and sesame. It was at a distance just a little more than four Parasangs from Baghdad, and its river headed towards the Sawad of Baghdad below the Sultans palace to Askaf and the other towns" (17).

Ibn Rusta in the 9th century wrote in his book "*al- Alik a-Nafisa and Kitab al Buldan*" (The valuable contacts and the book of countries) under the section (The road from Baghdad to *Khurasan*), where he said describing the *Nahrawn* town;

"From Bagdad to Nahrawn, the length of the road passes through continuous farms and date palm groves. It crosses Nahr Bin and Nahr Buk until it reaches to the Nahrawn and goes through it. In the western bank of the canal there were the chief markets, a Friday Mosque, and many water wheels for irrigation; while on the eastern bank there was a second Friday Mosque, and other markets, with many caravansaries and hostelries where the Mecca Pilgrims and travelers were accommodated" (18).

Ibn Rusta in this description makes reference to *Nahr Buk*, which was another branch from *Nahr Bin*, which irrigated the district of *Kalwadha* south of the Eastern Quarters of Baghdad¹⁹ (19).

In the area downstream from "*Sifweh*" where the "*Jisr el Nahrawn*" had stood remnants of many branching old distributaries

can still be seen today, which the local people knew by their new names such as *Khashm el Khor*, *Khashm Abu Dheeb* and *Abu Agul*. The trunk canal at this locality ran very close to the Diyala River, and it is evident that the river in its shifting later on had swept a considerable part of the town, which had stood on both banks of the old canal. Moreover, a little distance towards the south, the remnants of a bulwark or revetment is observed in the Diyala River, which was erected to turn the natural flow of the river and deflect it to prevent it from attacking the bank of the canal.

According to historical writings, there had been one weir on the canal just below “*Jisr Nahrawn*” for supplying many distributaries in this area, and it was called the “*Upper Shadhurwan*” to differentiate it from other one, which was located further down on the canal course. It is clear from this that the distributaries mentioned were supplied from the *Nahrawn* at this point. According to the same writings, it seems also that there had been a bridge on the canal downstream from the “*Upper Shadhurwan*” which was called (*Boran Bridge*) or “*Jisr Boran*.”

Further down, the canal came to the old market town called “*Aberta*” ⁽²⁰⁾ which was about thirty eight kilometer from “*Jisr el Nahrawn*.” *Aberta* was the only place on the *Nahrawn* that has retained the same name by which it was known among the Muslim Geographers of the *Abbasid* era, and it must have been a considerable city in the flourishing period of the canal. The *Syriac* word “*Aberta*” is equivalent to “*Abra*” which in Arabic means “*The Crossing Point*.”

The crossing here which carried the high road from the northeast of *Persia* to the capital *Ctesiphon* gave the town its name. It was a very famous road, which had connected Baghdad and *Khurasan* in *Persia* for very long time and it was on this road that most of the armies of the old empires had traversed in their advance and retreat.

The city was only 17 geographical miles or (50.8 km) away from *Ctesiphon* itself in a straight-line distance, and the road must have been a very busy one at that time, so the crossing had served a very good purpose.

A massive hydraulic structure stood on the canal at a short distance downstream from *Aberta* and was called “*Kanatir*.” This was the name given, at those times, by the Arabs to all similar weirs, but some other writers, however, referred to this particular structure as the lower weir or the “*lower Shaderwan*” due to the fact that it also included a weir for the control of flow (6),(21).

Felix Jones visited this site during March 1849 in his second journey along the *Nahrawn Canal*, and he made many notes on the canal and produced a remarkable sketch of this structure, which is shown in Figure (59). Sousa, on the other hand, gave in his book “irrigation of Samarra” a more refined drawing of this structure, probably based on later investigation of the site in which he assumed that there had been a navigation lock within the structure, and to support this he cited the writing of *al- Tabari* and *al- Ya'qubi* that the canal was navigable at this reach, Figure (60) (21).

Bashir Francis, a contemporary Iraqi historian mentioned the same weir in his “Encyclopedia of cities and sites in Iraq” as in following passage:

“This was a large dam on the Nahravn that was located to the north of the town called “Askaf Beni Joneyd” that was dug up by an expedition from the organization of the Iraqi Antiquities. The dam was on the remains of an older dam, from masonry of burnt clay bricks cemented by lime and ash mortar. In the dam there were gates to regulate the water level in the canal, so as to irrigate the district of “Askaf Beni Joneyd”. It was called during the Abbasids times by the “The lower Shaderwan” but when the dam was ruined, it caused the migration of the inhabitation of the district, and the whole region deteriorated” (22).

The canal at this location was 105 yards in width, and the bulky hydraulic structure, which controlled the flow, allowed the supply of the large branch canal(s) off taking from its left side, which had almost halved its flow.

The branch was called locally “*Shatt el Fareh*”, according to Jones, and it was thought to have irrigated the land south of Badra and Jassan as far as *Garaih Beni Sa’ied* northeast of Kut. Sousa’s drawing, however, indicated three streams branching from the left side and two more streams from its right side.

Downstream from these off take(s) by a distance of about 300 yards, well constructed massive walls, one on each side of the canal, extended down to the dam, which was built across the canal and

connected with it at right angles. Stout buttresses at convenient points supported these walls. The left sidewall formed a basin- like curve, had a solid rampart of 90 square feet area at its extremity and total length being 870 feet. The right side wall had an exposed length of 270 feet while the remaining part was covered by dirt sand that had accumulated on it. Both walls had heights, which ranged from 18 ft at the dam to 11 feet at their extremities. The breadths of the two walls were different, being as wide as 75 feet for the left sidewall, particularly at the location of the rampart, while the right side wall had only 12 feet breath, but where the buttresses adjoined, it attained widths between 22 and 29 feet.

The dam itself had a width of 110 feet, which included the sluices. These sluices had their sills considerably higher than the canal bed level to form a hydraulic control. The whole structure was built from masonry of very solid and hard clay kiln burnt bricks having a surface area of exactly one square foot placed on their edges and bonded together by a most durable mortar. The whole surface of the structure, where the strong current impinged, had been covered by concrete mortar composed of lime and large pebbles to fill any minute crevice that might have existed in the mass of the masonry. In all, this construction reflected that the people had attained a considerable skill in hydraulics science, while the methods and materials used to testify to their experience and skill in building such works capable of resisting the force of an impetuous stream.

The numerous large canals thrown off from the *Nahrawn*, in the immediate neighborhood of *Kanatir*, point out that the districts, which they irrigated as a thriving and densely populated area. The locals know the remnants of these canals in the immediate vicinity today by various names; *Zahreh*, *abu- Simsim*, *Abu Kleb*, *Naaejeh*, and *Rumeylat* canals are only examples.

The arrangement of these canals indicates that a well-arranged and managed network, which must have been well maintained also, affected the supply of water; otherwise, so many canals would not have worked in the first place. The high embankments along the banks at the intakes of these canals give evidence that they were constantly dredged year after year and kept them free from sediments. Acknowledging the fact that the steep slope of the *Nahrawn* itself had reduced the amount of sediment as a result of the high velocity of the current, but the construction of check structures as the one under consideration had reduced this velocity and increased sedimentation here.

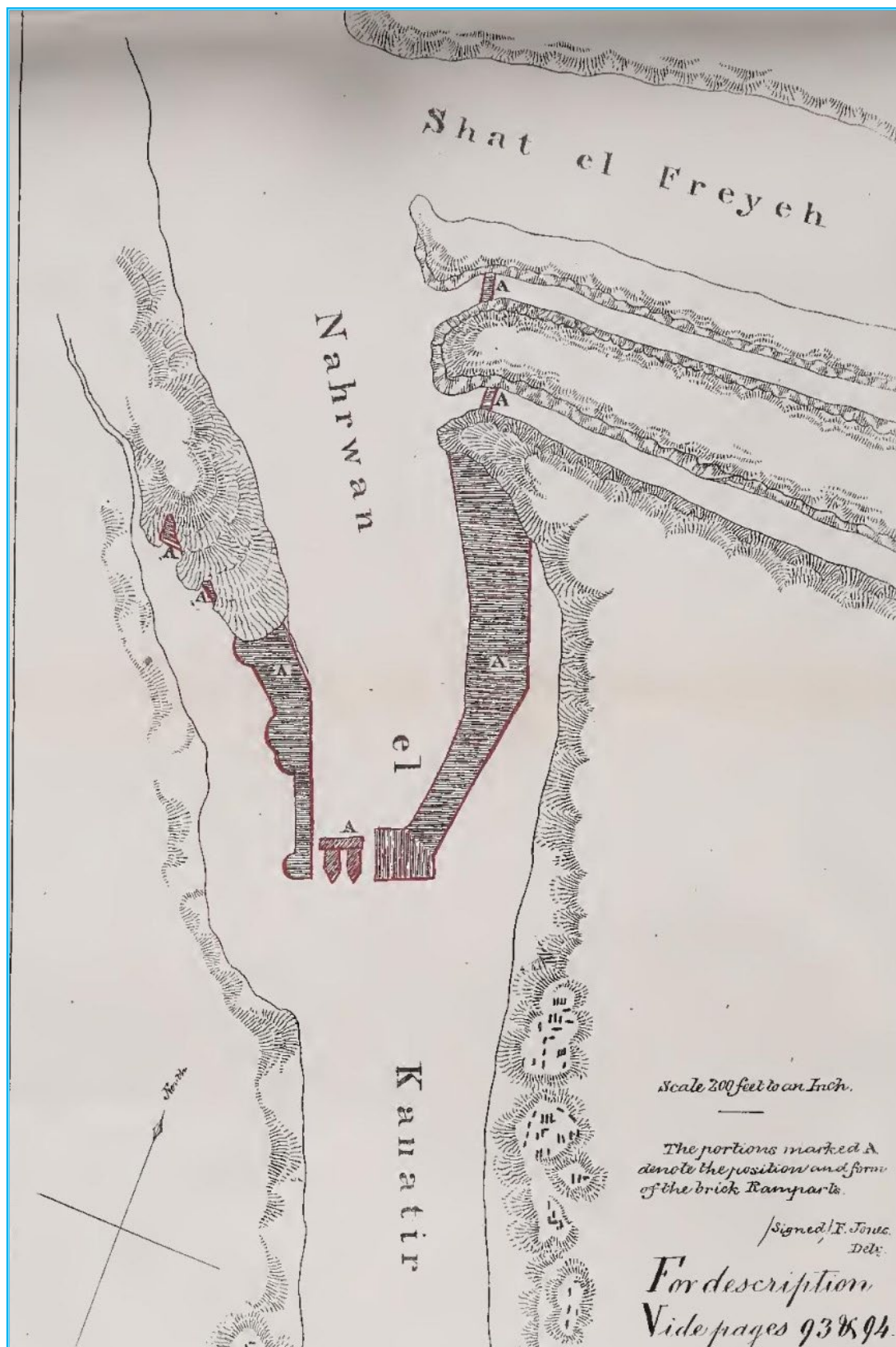


Figure 59: Drawing by Felix Jones of the “Kanatir”, or the “lower Shaderwan” (9)

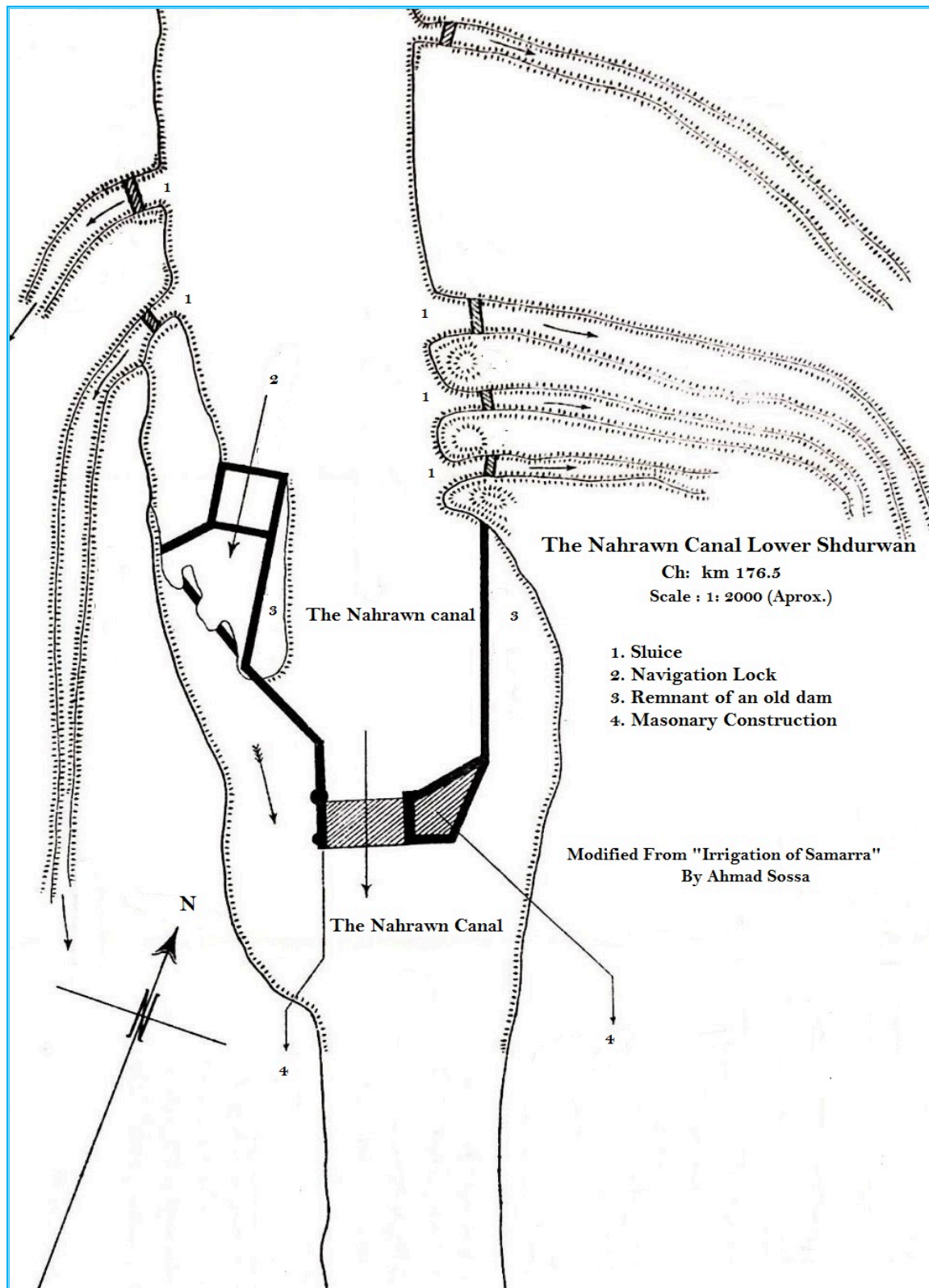


Figure 60: Drawing by Sousa of the “*Kanatir*” or the “lower Shaderwan” (21)

Next to the site of “Kanatir”, the canal passed another most extensively populated town. The ruins of the town are called today *Sumakeh* where some of the mounds of these ruins are more than fifty feet in height.

This place was the location of the *Abbasids* town called “*Askaf Beni Joneyd*” which was a thriving city populated by the clan of this name. The town had occupied both banks of the *Nahrwan* which were named; *Askaf el Uliya* (upper Askaf) and *Askaf el Sufleh* (lower Askaf) covering a strip of land, one to six kilometers wide and six kilometers long. The remnants of old piers on both banks of the canal imply they belonged to a bridge, which had spanned the canal to communicate between the two banks ⁽²²⁾.

Yakut al- Hamawi (1179- 1229) wrote in his “*Mu’jam al-Buldan*” or “*Dictionary of Countries*” that the town was deserted and left in ruins after the decline of the canal during the time of the *Seljuks*, owing to the dissensions of the empire and the ravages of the troops ⁽²³⁾.

Yakut who was himself contemporary to the *Seljuks* gave by this the indications to the time when the canal was actually destroyed and the reasons behind that. For after the *Turkish Seljuks* Sultans had been recognized by the *Khalifah a-l Muqtader* as protectors of the *Khilafa*, they had acquired enough influence to control the *Khalifahs* themselves and leave them only as figure heads. Their feuds caused the rapid decline of the *Khilafa* and left its lands in shambles and

chaos of which the destruction of the *Nahrawn* system was only one example.

The main course of the canal just after the town of *Jisr el Nahrwn* had diverged from the course of the old Diyala River, which was hitherto parallel to it. It took a sharp turn more towards the south so that the tract of land that was enclosed between it and the old course of the Diyala River at the top, and the Tigris River to the west increased in breadth, and the straight line distance between *Aberta* and *Ctesiphon* became about (51) kilometers as already mentioned, (see Figure (1))

After *Jisr el Nahrwn* most of the distributaries offtaking from the canal branched off from the *Upper Shaderwan* while the rest branched off at the *Lower Shadhurwan* at *Kanatir*. Most of the branch canals off taking from the *Nahrwn*, headed towards *al- Suweycheh marsh*, south of the modern town of Jassan, which is located on Iraq-Iran borders. Some other branches headed down towards the Tigris and reached as far as the ruins called today *Jumbil*, which was a large village not very far north of Kut and mentioned by *Yakut* as having the name of *Jubil* ⁽²⁴⁾ as already mentioned.

The trunk canal itself, however, continued in its course and poured into the Tigris at *Jarjaraiyeh*. The whole arrangement of these canals seems to have followed an incredible and well thought of design and indicates considerable previous planning, which are not seen at such extent even today in the most advanced countries of the world.

The confluence of the canal with the Tigris was located at the town of *Jarjaraiyeh*, which was described as a thriving and prosperous *Abbasid* city; from which came many poets and learned people. *Yakut Alhamawi* mentioned it as belonging to the *lower Nahrawn region* between Baghdad and *Wasit* on the eastern side of the Tigris and added that it became extinct after the ruin of the *Nahrawn* canal⁽²⁵⁾. The ruins of this town can be still seen today close to mouth of the modern canal known *Al-Shaoura* below the town called Azzizia.

These ruins stand as a landmark to where the main *Nahrawn* canal ended. But although the canal itself ended at *Jarjaraiyeh* the triangular area whose sides were the Tigris River, the canal and the course of the Diyala river at the top was covered by a complex labyrinth of branch canals and water courses, which originated from the canal and irrigated the environ of *Ctesiphon* in a crisscross fashion.

Ctesiphon was the capital of the *Parthian Empire*, and later on of the *Sasanian Empire* and it was the *Sassanid* King *Khosrow Anushirvan*, who ruled the *Sasanian Empire* from 531 to 579, who had dug the *Katul Kisrawi* aforementioned earlier in this chapter.

The town location was on the left bank of the Tigris River about 32 km southeast of modern Baghdad. It continued to serve as the capital of the *Sassanids* until the fall of the Sassanian Empire when the Arabs in 637AD overrun this region and changed its name to *al-Mada'in*.

Al-Ya'qubi wrote on *Ctesiphon* and the other towns on the road down from Baghdad to Kut. He stated that the distance between *Ctesiphon* (al-Madā'in) to *Wasit* (Kut) was five stages, the first town on the road towards *Wasit* was *Dair al- 'Āqūl*, which was the main city of the *Middle Nahrwan* and in which resided a group of leading non-Arab landowners (*Dihkans*). Next was *Jarjaraiyeh*, which was the main city of the *Lower Nahrawn* and the residence of some Persian nobles; next comes *al- Nu'māniyya* in which there was a famous *Dair* (Monastery) called *Dair Hizqil* where the mentally ill were treated (26).

Needless to say that all these towns flourished with the existence of the canal that supported cultivation in all the fertile areas around them but became desolate and waste lands after the canal declined.

The engineering works involved in the construction of the canal, whether it had been dug in one stage, or had been extended and developed in many stages, were extensive. In addition to the earthworks, which must have been millions of cubic meters of excavation and removal of earth, it involved also the construction of hundreds of bridges, aqueducts and weirs. The ruins of only few of these structures have been unearthed, but many more were either destroyed or still to be unearthed. Two gigantic engineering works of this canal which are worthy of detailed description are the two masonry diversion dams, which were built to divert the Adhaim, and Diyala Rivers, as explained already, which allowed the passage of the canal across the two rivers as they had posed obstacles to this passage.

The uppermost dam was the *old Adhaim Dam* whose remnants are called today “*al- band*,” a colloquial Iraqi-Arabic word for “*barrier*.” Its remnants are located on the upper reach of the canal few kilometers down from where Adhaim River leaves the Hemren mountain range. Dr. Ross from the British residency in Bagdad had visited the site in 1834 and he mentioned in his chronicle dated on 17 June of the same year that as he crossed the *Nahrawn Canal* above the village called Nei he noted that when water flowed in the *Nahrawn*, none could have existed in the “Adhaim River,” so the whole discharge of the river was diverted to other canals just upstream of this dam.

Coming to the actual site of the dam on 24 June, Ross wrote his description of it, so we learn that the dam was a masonry dam built from enormously large blocks of sandstone, which were quarried from the nearby Hemren hills. The dam was in the form of two sides of a square, one crossing the stream just where it left these hills, and the other running along the right bank. Though of a vast strength and thickness, the dam was, as it appeared, not of sufficient strength to resist the force of the water, and so it gave way in the center right down to its foundations and was swept away from the whole breadth of the stream. A sketch which was furnished by Dr Ross is shown in Figure (61) which may give a good idea of the layout of the dam ⁽³⁾.

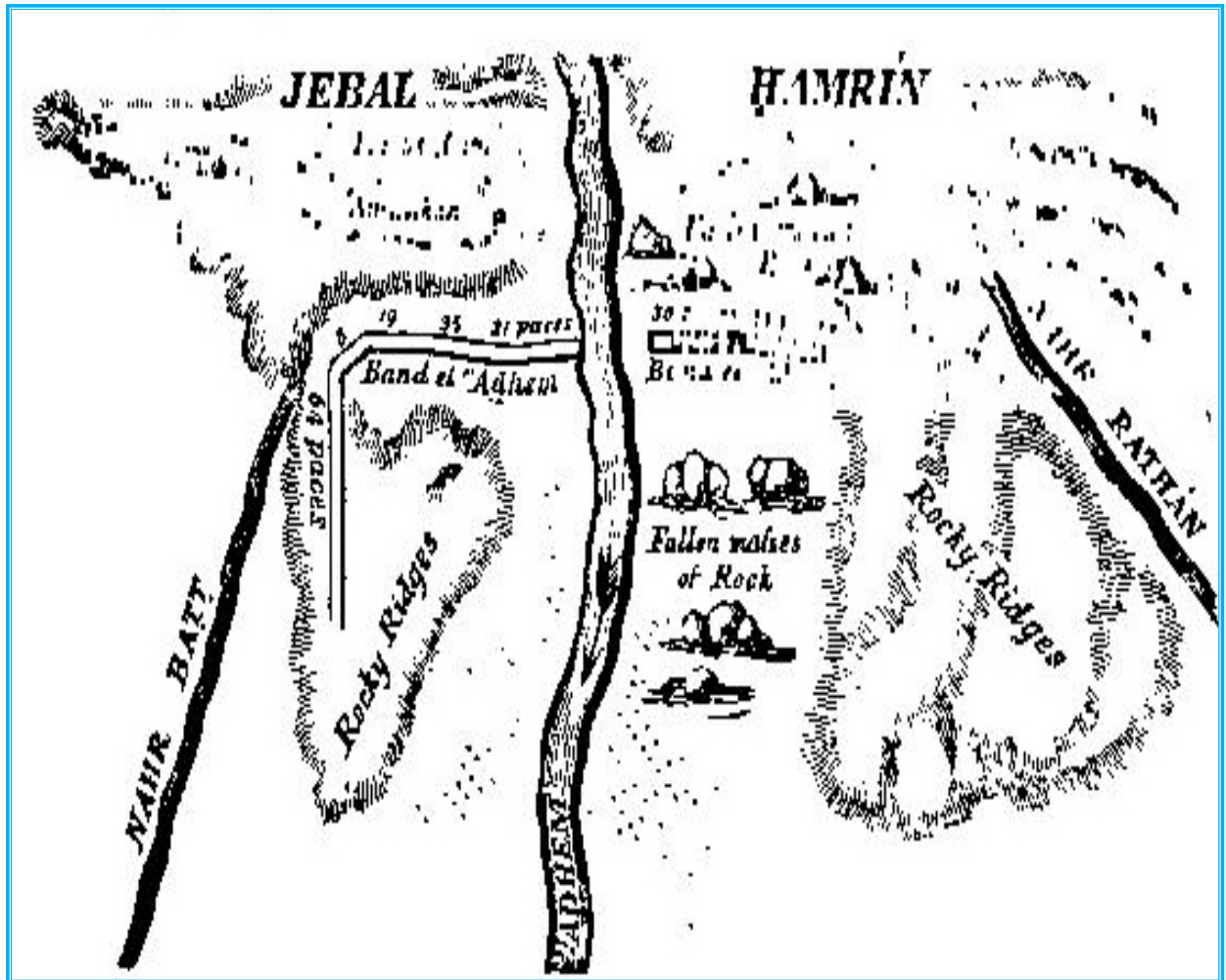


Figure 61: The original sketch made by Dr Ross of the remains at *Band al Adhaim* site ⁽³⁾

Commander James Felix Jones made another visit to the dam site in March 1849. In his reconnaissance journey and survey of the *Nahrrawn* canal course. He drew a more accurate map of the dam site and the related structures, but not without some mistakes; the result of this survey is shown in Figure (62) ⁽⁹⁾.

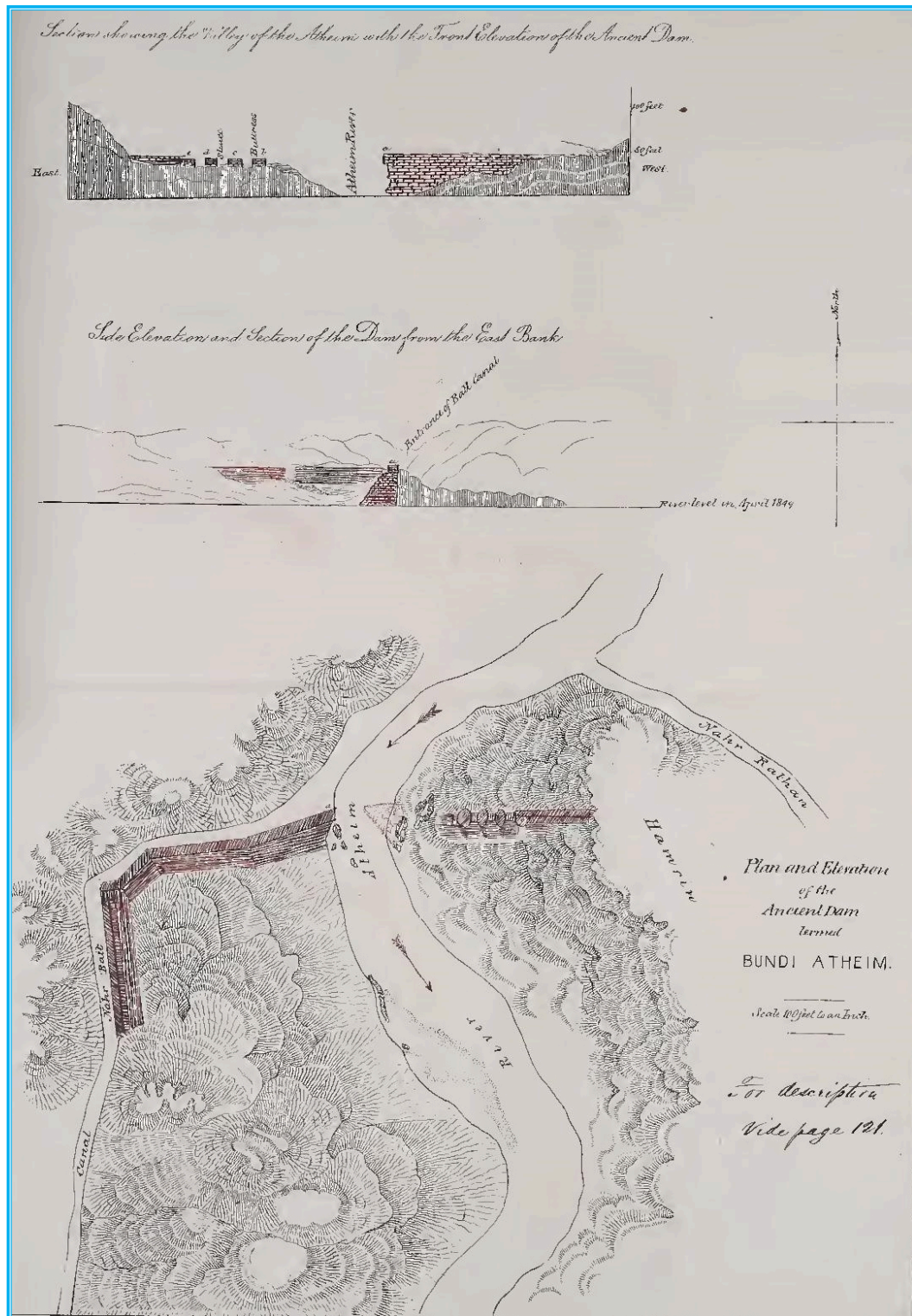


Figure 62: The Adhaim Dam remnants as surveyed and drawn by Felix Jones ⁽⁹⁾.

In the words of Jones, he maintained that before the *Nahrawn* could be put in operation, it was necessary to confine this destructive watercourse, and the skill and energy of the period were manifest in

this work. Jones was aware of the huge flashy floods that the Adhaim River could bring during the rains of the wet season, although the stream would be reduced to a small stream during the dry part of the year.

Additional notes left by Jones gave very clear description of the structure in which he reported the following:

“The dam was at one time a very strong work, composed of roughly hewn blocks of sandstone, purposely wrought with uneven edges to give a greater hold to the concrete employed in binding them together. The blocks varied in size and shape, some being oblong, while others were square; the later had a length of three feet, while the former of one foot and four inches only, but both had the same thickness of one foot and four inches. The concrete used as mortar showed a very good durability; it was made of an intermixture of minute pebbles with lime of a very fine quality, obtained as was the stone, in the immediate vicinity. The dam wall was set at right angel to the direction of the stream, as shown in the plan and the long section given in [Figure (62)], but on the right bank it turned after some distance with a bend towards downstream as shown in this plan.. The upstream face of the dam was vertical; while downstream face was inclined and built in a terrace-wise fashion from the base upwards as shown in the cross section shown in the aforementioned .The breadth of the base was thirty six feet which gradually decreased to twenty three feet at the terrace six feet below the crest. Judging

from these dimensions and the back slope of the wall, the height of the dam must have been about forty feet”.

Sousa in his book on the irrigation of Samarra gave the same sketch but added some more details, with respect to the branch canals and the sluices, moreover, he showed a long section in addition to a side view of the dam , Figure (63) ⁽⁷⁾.

The flow of the river Adhaim was diverted to two canals originating at the upstream of the dam. This was necessary to allow the crossing of the *Nahrawn Canal* at some point in the downstream. The left side canal took its supply from a sluice that formed part of the left wing wall of the dam as given in the two already shown figures. As the works stand today, the remnants of the sluice show, the sill level was set at an elevation of some thirty three feet above the present bottom level of the river. This meant that the level of water was raised in front of the dam at least by this amount in order to start feeding the canal on this bank and therefore, creating a permanent pool of water behind the dam. The canal was itself called “*Nahr Rathan.*”

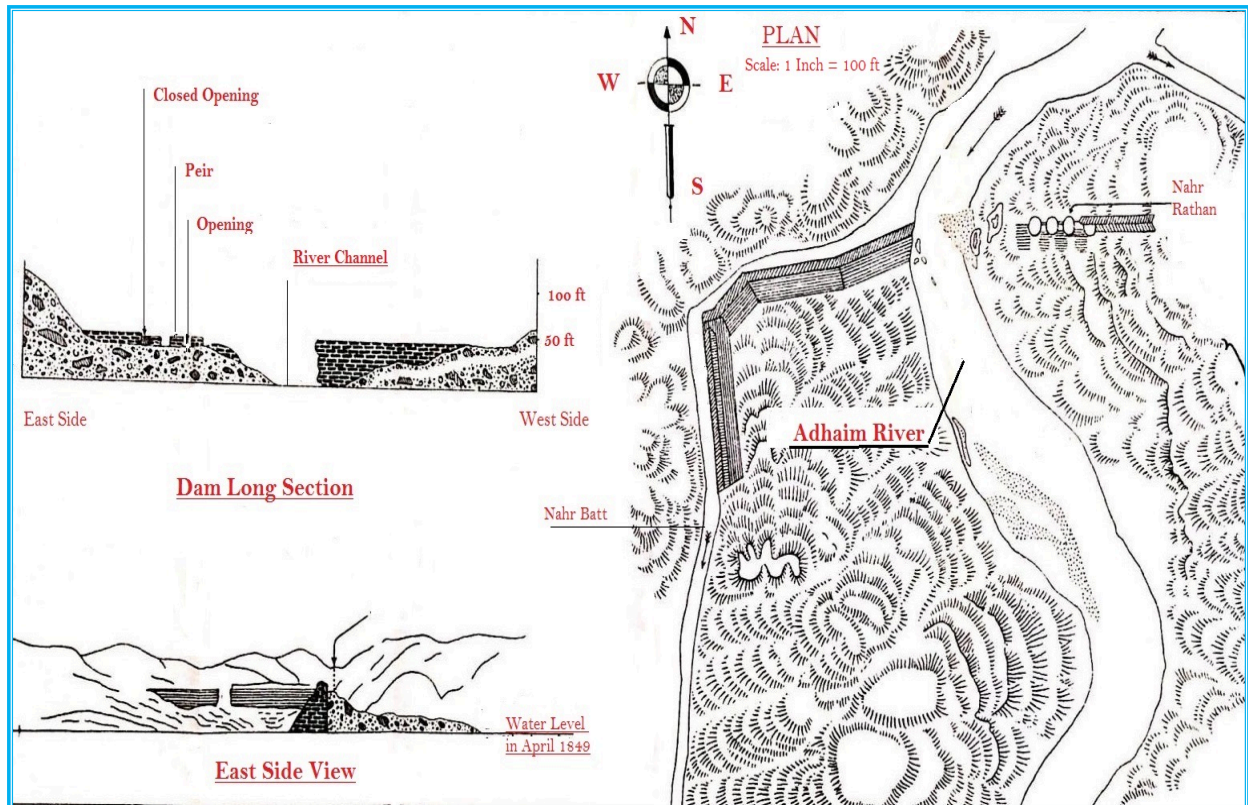


Figure 63: Sketch by Sousa for the remnant of Adhaim Dam based on Felix Jones drawing ⁽⁷⁾. Nomenclature is changed to English by the Writer.

In both of the preceding descriptions, there seems that the course of the “*Nahr Rathan*” was plotted by the two writers in the wrong place because the canal mouth should be downstream of the sluice and not at the upstream of the dam, otherwise, the sluice would be rendered useless. The Sluice, as it was designed and built consisted of two abutments and three peirs, which were fourteen feet in height, fifteen feet in breadth and thirty-five feet in length each. The peirs were spaced at about seven feet and four inches leaving openings of this width. The structure was completely built of burned bricks, but the last opening was closed by sandstone masonry construction. Moreover, one additional course of sandstones was used at the top of the structure ⁽⁷⁾.

“*Nahr Rathan*” irrigated at that time all the lands to the east of the old course of Adhaim River, which were parts of the “*Upper Rathan Tusuj*”; comprising some of the wealthiest *Tusuj* during the good days of *Nahrawn Canal*. The right side canal was called “*Nahr Batt*” which had its intake above the riverbed level in the form of a cut from the side of the river at a distance of about two hundred meters upstream from the dam. It supplied irrigation water required for the cultivated area between the old course of the Adhaim River and the “*al- Shari’e*” depression east of Sammara belonging to the “*Lower Rathan Tusuj*”. At the same time “*Nahr Batt*” acted as a flood escape for the River Adhaim by passing the excess water to “*al- Shri’e*” depression through one wadi called “*Wadi U’Sayla*”, whereby the excess water from the “*al- Shri’e*” could be relieved to the Tigris River through another wadi which is called “*Wadi el-Sadda*”⁽⁷⁾.

According to Jones, the center part of the dam, in the river channel, was swept away because of neglected repair, or had been destroyed by an enemy, which was the more probable case. Photographs recently taken of the remnants of this dam are shown in Figure (64) which gives good idea of what the dam looks like today.



Figure 64: Various views of the remains of the old Al- Adhaim Dam
 (Source: from the writer personal collection)

The second diversion dam that was constructed for the sake of keeping the continuity of the *Nahrrawn* canal by passing it across natural large rivers was the Diyala Dam on the Diyala River which was mentioned previously, (Figure (1)). Some of the engineering features are given here to clarify its size and details, for it was a very large masonry dam built of sandstones blocks quarried from a nearby site at Hemren Mountain. The remnants of the old dam can still be seen close to the intake of the Ruz canal before it was relocated in the seventies of the last century. From these, it can be concluded that the dam was in the form of gravity retaining wall with a base of about 11

meters width, top width of 2 meters and a height of 12 meters above ground level. Its length was 137 meters, out of which 61 meters were in the river channel and the remaining length on the banks as wing walls. The masonries used were cut stones ranging in size from 0.41 meter to 0.9 meters in length, and 0.45m to 0.61m in width; all having a thickness of 0.41 m. The mortar used to bond the masonry was a mixture of gypsum powders, burned gypsum with water and fine aggregates in the form of pebbles giving the mix the strength of concrete when dry.

The dam was provided by gated sluices to release excess flood water from the river back into its original course through a flood escape channel which ended at “Bajisri” as can be seen from the earthworks remaining at this place and as explained already. In such case, the amount of the released water had to be carefully regulated not to overflow the canal itself.

From careful reading of the history of the *Abbasid Khilafa*, the collapse of the two dams and the canal as a whole was the direct result of the process of decline that the *Abbasid Khilafa* had undergone since the death of *Khalifah al- Mutawakkil* which had continued during the *Buwayhids* and *Seljuks*’ domination over the *Khilafa*.

The frequent fighting between the competing commanders over power and the intentional destruction of water works as a mean of defense contributed greatly to the collapse of the *Nahrawn System*, in which those two dams were basic and important elements; moreover,

negligence and lack of maintenance aggravated their conditions tremendously.

The final destruction of the little that was left of the irrigation works of Mesopotamia, including the *Nahrawn System*, which had taken thousands of years to build was done on the hands of the Mongols after their invasion of Iraq and the fall of Baghdad in 1258AD ⁽²⁷⁾ marking the end of the *Abbasid Khilafa*.

The extent and magnitude of the *Nahrawn Canal* system is very difficult to comprehend even by present day's scales, but just to show the vast land that it served the map in Figure (65) may illustrate the multihued of town and settlements that depended on it. This Map was the result of painstaking work carried out by Robert Mac-Adams and his team from the University of Chicago, who had carried out the survey of all remnants of the archeological mounds and the canal in (1957- 1958) ⁽²⁸⁾.

In a final remark, we may conclude by adding to what has been already said many times before of these great human achievements; that they were to serve in the end the prestige of the rulers.

Ya'qubi (896- 956) in his book "*The Meadows of Gold, and Mines of Gems*" quoted *Khosrau Anushirvan* the great *Sassanid king* who had contributed immensely to the extension of the *Nahrawn* and its upkeep of saying:

"Royal power rests upon the army, and the army upon money, and money upon the land- tax (Kharaj), and land- tax upon agriculture, and agriculture upon just administration, and just

administration upon the integrity of the government officials, and the integrity of government officials upon the reliability of the vizier, and the pinnacle of all these is the vigilance of the king in resting his own inclinations, and his capability so to guide them that he rules them and do not rule him” (29).

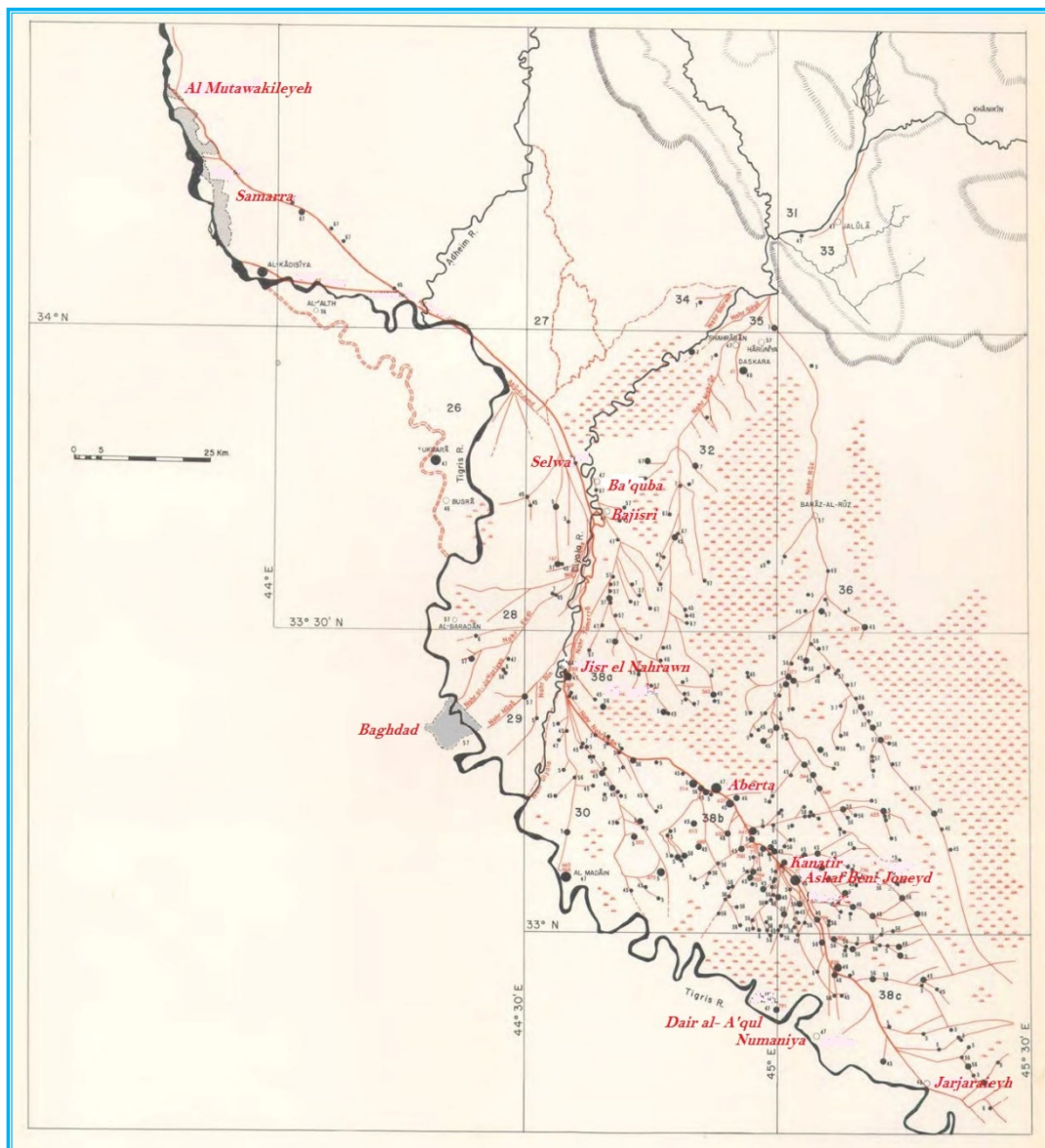


Figure 65: Map of the area surveyed by Mac Adams and his team of the towns and settlements served by the canal (28).

The wisdom in this saying is clear, that; building such works to promote agriculture serves in the end to generate the money needed by the army on which the king builds his power and glory, provided that the king himself is strong and wise enough to select and control his aides. This was very true all the time during the *Chaldeans*, *Parthians*, *Sassanids* and the first three hundred years of the *Abbasids Khalifah*. This unfortunately answers also to the question why the whole systems began to crumble and fail at the final stage of this *Khalifah* when the *Khalifahs* were weak and had no control over the army; their viziers looked only for their own interest and were negligent and corrupted, and not vigilant enough to see to the good administration of such works.

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Sammara and its Canals

In the history of the *Islamic Khilafa*, the construction of new canals and the revival of old once was always associated with the establishment of new cities, not only for irrigation and expanding agriculture around these cities, but also for providing drinking water supply, ablution water for the mosques and for the supply of pleasure pools and fountains. This was the case for *Basreh*, *Wasit*, *Kufah*, *Bagdad*, and finally for the last one *Samarra*.

Samarra was built by the eighth *Abbasid Khalifah al-Mu'tasim bi'llāh*, who ruled from 833 AD until his death in 842 AD. A youngest son of *Khalifah Harun al-Rashid*, he rose to prominence through his formation of a private army composed predominantly of Turkish slave-soldiers (*ghilmān*). Those he bought from Samarkand, Khwarazm at the fringes of the Muslim world in Central Asia and from other high ranking people in Baghdad who owned many of them. His inclination towards these Turkish slave soldiers was because his mother was a Turk, and that he wanted to avoid the fierce competition between the Arabs and Persians that occupied government and army positions. One of the main reasons, which led *al-Mu'tasim* to the building of Samarra and moving the capital of Khilafa there, was the problems raised by the presence of these Turkish slave-soldiers in Baghdad.

Although this private force numbered in the beginning between three thousands and four thousands, they often came into conflict with the city's populace who resented their presence, being foreign troops, and who were furthermore, often undisciplined, arrogant and violent. They were used to run their horses in the crowded markets of Baghdad causing havoc and trample people under their horses and even causing the death of some. The reaction of the mob in those cases was overrunning and killing them, which disturbed and saddened *al-Mu'tasim* and made him decide to move to a new city that he would build.

In his search for a new site of the future capital, *al-Mu'tasim* inspected many locations to the north of Baghdad. After rejecting many sites such as *Bardan*, *Bahamsha*, *al-Matera*, he decided first to build the city on the *Katul-Kisrawi*, but he abandoned the idea as the place was gravelly with not much soil. Finally, his choice fell on the present site not far from the *Katul Kisrawi* at the place known as *at-Tirhan* on the east bank of the Tigris that belonged to a Christian monastery monks which he bought from them for 4000 dinars ^{(1),(2)}.

He favored the new site because of its fresh air and for being close to *al-Hayer*, which was a very good and rich hunting ground. In laying out the city, *al-Mu'tasim* saw that the Great Mosque was at the heart of the city, while the court of the *Khilafa* and his residence in *Kasr al Jawsaq* (palace) was very close to the north of the Mosque. The various markets were planned and built around the Mosque, one market for each profession following the example of Baghdad.

Residential areas were separated from the markets, and the militaries were given their own cantonments, separated from the ordinary populace. The *Turk* leader, *Ashinas* and his “*atrāk*” soldiers were given *qati’as* (land Grants) at the place known *al-Karkh*, while the *Uzbeks* from *Fergana* and their leader *Khan Artuj* were settled close to *al-Jawsaq Palace*. *Al-Afshin* and his Persian troops called *Shakiriyya* troops were located to *al- Matira* to the south. *Al-Mu’tasim* following the extravagance of his predecessors ordered the building of other palaces for himself at various locations in and around the city such as *al- Umari* and *al- al- Waziri* palaces, Figure (66).



Figure 66: Map of Samarra and its surroundings showing *al- Mutawakkiliyya* which was built later on by *Khalifah al- Mutawakkil*, (modified from source in reference)^{(3).(4)}

Unlike Baghdad, the new capital was an entirely artificial creation, poorly sited in terms of water supply and river communications. Irrigation water could not be brought to the city from the nearby *Katul* due to its higher elevation, and it seems that irrigation water was taken out of wells. *Ibn Rusta* tells us that drinking water was carried on the backs of pack animals to where it was needed in the city and that there was a large number of them in town⁽¹⁾.

When *al-Mu'tasim* finished surveying and laying the foundations of the buildings on the east side of the Tigris, he then built a bridge to the west side of the Tigris. There, the land was different from the right bank, mainly fluvial and fertile, so he established there cultivated areas, orchards and gardens; he had canals dug from the Tigris, and each military commander was entrusted with the development of one part. Date palms were imported from Baghdad and *Basrah* and other areas of the *al-Sawad*, and plants were brought in from the *Jazira*, *Syria*, *al-Jabal*, *al-Rayy*, *Khurasan* and other regions. Water was plentiful for these cultivated areas on the west side of *Samarra*. The date palms flourished; the trees took roots; the produce ripened. The fruits were excellent, and the herbs and vegetables were good.

People planted various kinds of crops, herbs, vegetables, and succulent plants. Because the land had been fallowed for thousands of years, wherever was planted it flourished, so much so that the revenue from the cultivated areas along the canals had so much increased from the locations known as the *Ishaqi Canal* and alongside it, the *Itakhi Canal*, the *'Umari Canal*, the *'Abdul Maliki Canal*, the *Masruri Canal* and the *Sif Canal*, in addition to the five villages of *al-'Arabat al-Muhadditha*, and the seven lower villages. The orchards, and gardens revenue, plus the *Kharaj* taxes on agricultural property amounted to 400,000 dinars a year, while the income that came from the city and its markets amounted to 10 million dinars a year⁽⁴⁾.

The *Nahr al-Ishaqi* irrigation canal was one of the largest schemes that were attributed to *Al-Mu'tasim*; as in his grand work he

embarked on the revival and development of this old canal, which was originally an ancient canal that had its intake 10 kilometers downstream from Tikrit. To achieve this new development, *al-Mu'tasim* tasked his police chief, *Ishaq ibn Ibrahim al-Khuza'i*, to oversee the construction of the project which was named after him, although it might have been named after al-Mu'tasim himself, for his agnomen (*kunya*) which he was commonly known by, was *abu Ishaq*⁽⁵⁾.

The scheme consisted of two parts; the first was the re-excavation and re-modeling of the upper reach of the old canal which appeared to belong to *Partho- Sassanian* times and was abandoned at this time. It had run in southerly direction for about four kilometer parallel to the Tigris River and passed the locations of *al-Huwasilat*, *al Ashiq Palace*, and *al-Salibiya*. The second part was the newly excavated reach, which departed from the old course after twelve kilometer to the south of *al-Salibiya* and then flowed in a southeasterly direction. The remnants of the old canal show that it had continued in southwesterly direction for forty more kilometers and had irrigated the land between the Tigris and Euphrates until it ended in *Akarkuf* depression west of Baghdad.

The new canal continued its course all the way southwards to the *Istablat military* camp forming part of its fortifications, and supplying it with water, as we shall describe later. The canal having left *Istablat* camp continued in a sinuous course south from the camp for another thirty kilometers to end in the *old Dujail* canal⁽⁵⁾⁽⁶⁾, Figure (67).

At *al- Huwasilat* (see Figure (66)) the remains of a very large palace are seen today, which belonged most probably to *Kasr al- Juss* palace built by *al-Mu'tasim* for his pleasure and mentioned by Yaqut in his "*Mu'jam Al Buldan*"⁽⁷⁾. The buildings had an area of more than nineteen thousands square meters while the outer walls of the palace grounds contained an area of one hundred and thirty thousand meters.

The palace ground was located on the Tigris River itself and extended to the left bank of *Nahr al- Ishaqi canal*, so it may be assumed that the palace gardens were irrigated from canals that branched from the *Nahr al- Ishaqi* and poured back their remaining waters into the Tigris.

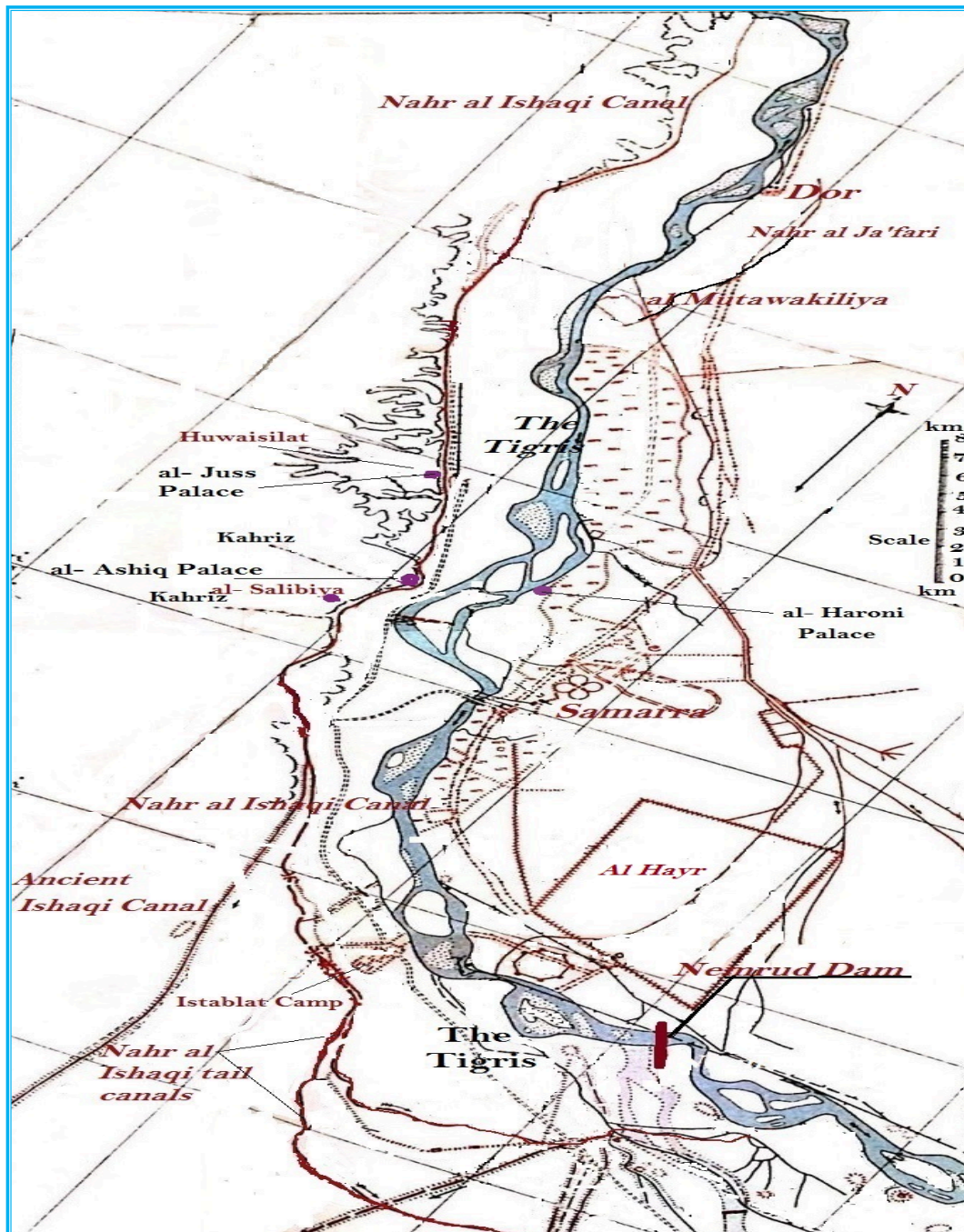


Figure 67: *Nahr al-Ishaqi* canal course, modified from reference ⁽⁶⁾

The other remarkable palace that was built on the right bank of *Nahr al- Ishaqi canal* and 16 kilometers from the modern city of Samarra was *Kasr al-'Ashiq* (The Lover palace). It was located on higher ground than the level of the canal itself and had a sweeping view of the Tigris River to the east. The palace was built by *Khalifah*

al- Mu'tamid who had reigned from 870 to 892, and was the last *Khalifah* to stay in Samarra before shifting the capital back to Baghdad by his brother and successor *al- Mu'tamid*.

This palace is a prominent surviving example of the *Abbasid* architecture, and one on which the Iraqi Department of Antiquates and Heritage had saved no effort in its restoration during the 1980s, Figure (68). The building has a rectangular shape of 140 meters and 93 meters long sides, which is surrounded by an outer wall of 230 meters and 178 meters of side lengths. The building consists of two floors; the lower one was formed of catacombs and vaults, while the second was for residence and other functions. Outside the walls exists a long moat but as the levels of the palace and the moat were higher than the water level of the adjoining *Nahr al- Ishaqi* so water supply was drawn from an underground channel (*Kariz*) which flowed from the western higher land, Figure (69).



Figure 68: South view of *al- Ashiq* Palace



Figure 69: Overall view of *al- Ashiq* palace showing the Tigris River in the background ⁽⁸⁾.

Flowing south still, *Nahr Ishaqi canal* came to the site of *Istablat* (Stables); this was a very large encampment established by *Khalifah al-Mu'tasim* when he moved to *Samarra*, and it was intended as a military camp for his troops “*the Maghariba*”, a military unit apparently of Egyptian origin^{(9), (10)}.

The total area reserved for the camp was 233 hectares, but the area of the establishments as seen today has an area of 111 hectares. The location of the site is on the west bank of the Tigris River at a distant of about 15 kilometers south from the modern city of *Samarra*, Figure (70). Its plan consisted of a small rectangle containing the palace, which was adjacent to a larger rectangular area reserved for the army. The palace ground was 500 meters long and 215 wide, and its remnants were thought by Professor Northedge to be the palace of “*al- Arsh*” built by the *Khalifah al Mutawakkil*, the grandson of *Khalifah al-Mu'tasim*. The length of the larger rectangle is 1700 meters, and the width is 550 meters. This part was intended for the

housing blocks occupied by the army commanders, officers, and the soldiers' barracks in addition to the training fields and stables for the cavalry. This whole encampment was surrounded by a massive wall⁽¹¹⁾.

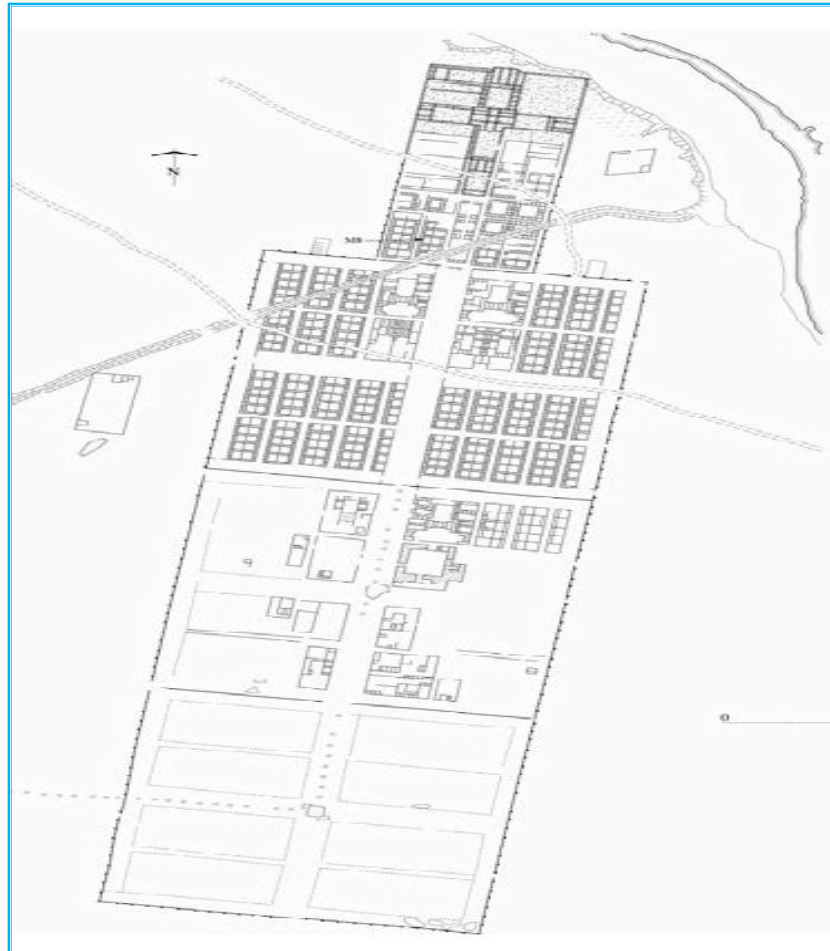


Figure 70: Istablat Camp site south of Samarra ⁽⁹⁾

The barracks were to house 250,000 soldiers, and the stables are said to accommodate 160,000 horses ⁽¹⁰⁾ and the remaining part of the site contained pasture land for feeding the horses.

The camp area was served with water by *Nahr al- Ishaqi*, which had its alignment so chosen as to run along parts of its western and southern peripheries forming at the same time part of the camp fortifications.

Three canals branched from *Nahr al Ishaqi* and entered the site of *Istablat*. The northern branch passed across the camp to the northwest of the barracks and ended in the Tigris River after skirting these barracks. The middle branch bifurcated from the main canal at a point 1800 meters south of the northern branch intake and crossed through the barracks to end in the Tigris River also.

Just downstream from its intake, one cross weir was constructed on *Nahr al-Ishaqi canal* to raise its water level and feed this branch; the remnants of this weir are seen today as brickwork piers indicating three openings. As for the third branch which branched from the main canal at about 500 meters to the south from the middle branch intake, it ran between the main canal and the outer boundary of the camp for considerable distance and entered the camp from its southwest corner to leave it after a short distance. It then traversed some distance to join the *Dujail* canal afterwards at a point located about four and a half kilometers above the point where *Nahr al Ishaqi canal* itself ended in the *Dujail* canal also.

Similar to the middle branch, a second cross weir was constructed across the main canal in order to raise the water level and feed it while two crossings were built on the main canal south of the intake of the last branch to allow access to the camp area.

When *Khalifah al-Mu'tasim* died in 842, he had left already a legacy of many buildings and construction works, which had made of *Samarra* a flourishing city, and made its cultivations on the left bank a source of food for the population. This is not to say that these lands

were not productive before. The area of cultivation had increased many folds due to the re- excavation of the upper part of the old *Nahr Ishaqi* canal and extending it further south towards the *Dujail* canal that stretched down to Baghdad and irrigated its northern quarters.

Khalifah al-Mu'tasim is also credited for building many grand palaces for state functions, residence and for pleasure and entertainment. These were *Kasr al- Jawsaq*, *Kasr al- Abdul Maliki*, *Kasr al- Juss*, *Kasr al- Kusur*, *Kasr 'Amoriyya'*, *Kasr Al Mathameer*, *Kasr al- Amani* and *Kasr al-Khaqani*,⁽¹²⁾; *al- Ya'qubi* adds two more palaces; *Kasr al Umari* and *Kasr al Waziri* ⁽¹³⁾. It is also known that he built the *Kasr al- Haruni* for the residence of his son *al- Wathiq*.

With respect to the other public works that *Khalifah al-Mu'tasim* completed, it is fitting to mention the grand congregational mosque, and the wild animal reserves *al- Hayr* which he established at the southern part of *Samarra*, (Figures (66) and Figure (67) ⁽¹⁴⁾.

It was not unusual for the *Abbasid Khalifahs* to have such wild animal reserves. *Khalifah al-Ma'mun*, for example, who was *al-Mu'tasim's* older brother had a similar reserve established in his palace *al- Hasani* in Baghdad to please his wife *Boran*, and he brought water to irrigate its grounds by digging a branch canal from *Nahr Al Mu'alla canal* ⁽¹⁵⁾.

The area of *al- Hayr* was only 100 hectares, but it was *Khalifah al-Mu'tasim* grandson, *Khalifah al-Mutawakkil* (847- 861), who enlarged it later on to have it as both an animal reserve and hunting area.

In considering all the water works constructed in *Samarra* during its time as the capital of *al- Khilafa*, we find that *al- Mutawakkil* was much more ambitious than his grandfather *Khalifah a-l Mu'tasim*, for *al- Mu'tasim* was contented with the supply of drinking water to the city from the Tigris River carried in leather bags by pack animals. He instead of attempting to irrigate the city itself turned his attention to the right bank of the Tigris by reviving the upper reach of *Nahr al-Ishaqi* canal.

Al- Mutawakkil, on the other hand, had a special interest in grand public works, so he decided to bring water to the city by digging canals and allowing water to flow by gravity to supply his palaces and pleasure pools and other places of interest.

In this work, he undertook a series of challenging schemes in spite of the undulating topography and the hard conglomerates that formed most of the terrain where these works had to be excavated. The largest of these undertakings was the scheme named after him as the “*al- Mutawakkil Canal*.” However, to say the truth this was not strictly an open channel, but it was a series of open cuts and tunnels that followed the topography of the ground and stretched its length penetrating high grounds at some parts and flowing in an open cut in others. The system used was similar to the *Kariz* system but in a reverse fashion, as illustrated by Figure (71) and Figure (72).

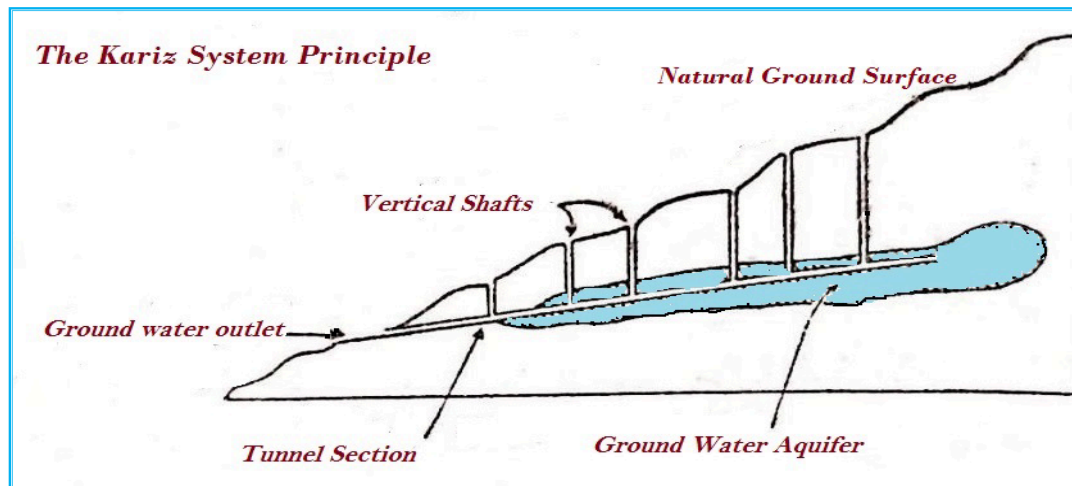


Figure 71: Normal Kariz Excavation Method

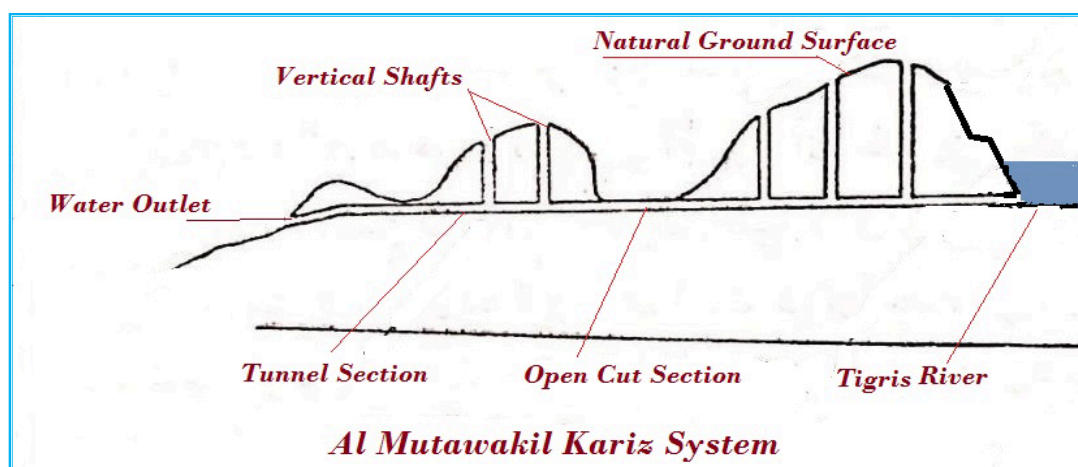


Figure 72: Khalifah al- Mutawakkil method of Open cut and Kariz Excavation

Normally any *Kariz* is tunneled through a hill or higher land and driven upwards towards a water bearing aquifer. By this way water is allowed to flow towards the surface at the entrance. The excavation process of any *Kariz* is carried out by digging the tunnel together with vertical shafts or wells along the axis of the tunnel under construction. The shafts allow the removal of the excavation materials up to the ground surface and provide additional access for the workers. More shafts are dug as the work progresses at regular and comfortable intervals until the end of the *Kariz* is reached in the prescribed point. In *al- Mutawakkil* project, excavation work started from the inlet on

the Tigris River and tunneling work continued in a downward slope using the *Kariz* arrangement for the distance required, which reminds us of *Sinnecharib's Bastora-Erbil* project, which was described in chapter (4).

The general slope of the natural ground helped in directing this tunnel towards the low lands where the water was needed. In this scheme, the water channel was formed by two identical and parallel watercourses, which had their entrances located on the Tigris River at a location north of *al- Dour* at about 40 kilometers north of *Samarra*. The two watercourses ran into a combination of *Kariz* and open cut construction, which was decided by the topography and the ground surface elevation. The two watercourses ran in two separate *Karizs* for the first few kilometers, parallel to the Tigris River, after which the left hand *Kariz* ran for two kilometers in open cut and then continued in a *Kariz* tunnel alongside the right hand *Kariz*. They both went through *al- Dour* in this manner and then followed the left bank of the *Katul Kisrawi canal*; the upper feeder of *Nahrawn Canal*.

After twenty kilometers south of *al- Dour* they appeared again in two separate open cuts for the next few kilometers where they united in one open channel, which turned down and crossed the *Katul* at kilometer 22. This crossing was affected by a large aqueduct which was constructed on the *Katul* at this point.

The purpose of constructing dual watercourses instead of only one was to use one of them during the low water season when the water level in the Tigris is low, and to use the second one to pass the

flow during floods and high water seasons. This arrangement was similar to the two feeder canals (*a-l Qaim and al- Sanam*) of the *Nahrawn Canal* which was fully described in chapter 9.

The excess floodwater entering to the *Kariz* at *al- Dur* could be drained later on to the Tigris River by special drainage channel after the combined watercourse had crossed the *Katul* as shall be explained later. Moreover, as the Tigris River normally carried heavy silt and sediment loads during floods, it was necessary to construct a number of desilting basins along this watercourse to reduce the quantity of sediments and silts carried down to the users. These settling tanks or earthen reservoirs were similar to the desilting basins usually used in modern practice for very large irrigation canals in the world today.

The provided desilting basins were called in *Samarra* by “*Dahader*” and the accumulated sediments were dredged regularly and the materials were placed on the peripheries. The aqueduct, which carried the flow of the combined watercourses across the *Katul* *Kisrawi*, must have had its bottom about 3.5- 4.0 meters above the bottom of the *Katul*; which was concluded from surveying of the remnants of both the *Katul* and the watercourse.

The discharge flowing out from the aqueduct poured directly into a very large earthen tank in the form of reservoir, which was located at the western side of the *Katul*, so that two secondary branches emerged from this reservoir in addition to the main stream forming the backbone of the scheme.

The first secondary branch was called *Nahr Murayr*, which was, in fact, the floodwater escape channel, which took the excess water carried by the *Kariz* from *al- Dur*. This channel was twenty meters wide and three kilometers long, and it ran westwards alongside the eastern side of *Ashnas wall* and ended into the Tigris, therefore, draining the excess floodwater that had reached the reservoir. The intake of *Nahr Murayr* was provided with regulating structure to control the discharge according to the needs.

The other secondary branch ran eastwards alongside the *Katul Kisrawi* itself until it reached the palace known as *al- Dakka Palace*, which was built on the right bank of the *Katul* and was overlooking it. Two arched masonry bridges spanned the canal at a distance of 50 meters before and after the palace. The canal, itself passed below the palace in masonry vault and emerged from the other side. The canal also supplied water to a small pond, which was located at the southern front of the palace.

The main stream intended to supply the city emerged also from the reservoir and flowed southwards towards *Samarra* in the usual open cut and *Kariz* combination, and reached it after traversing a distance of forty kilometers measured from the beginning of the scheme at the intakes on the Tigris River.

In and around *Samarra*, the *Kariz* supplied the various districts and places of importance by a series of secondary *Karizs* or canals. In Figure (73), the course of the main scheme is shown from the intakes

down to below *Samarra*. In the lower part of the figure *Nahr Ishaqi* canal is shown on the right bank of the Tigris River.

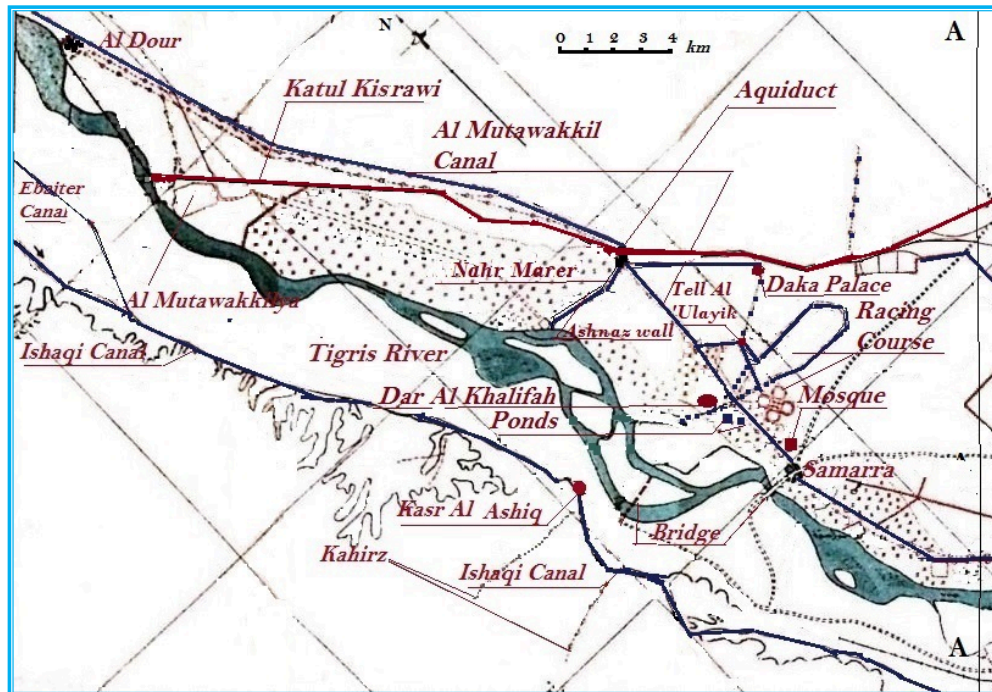


Figure 73: The course of *al- Mutawakkil* main scheme from the intakes to below *Samarra*. At the lower part on the right bank of the Tigris River the *Ishaqi* canal is shown. (Note the matching line A-A in this map with the same in the next map of Figure74)

The first secondary *Kariz* that bifurcated from the main watercourse went eastwards towards an artificial mound called “*Tell al ‘Ulayik*, which overlooked the racing arena. So it may be assumed that the mound was constructed probably for the *Khalifah* to watch down on the racing arena during races and tournaments.

The water from this secondary *Kariz* poured into a trench which circulated around the mound in full circle and discharged back into another *Kariz* to take the returned flow back to the main scheme. Meanwhile, the trench supplied an open canal which went around the periphery of the main racing course, so that its water could be used to sprinkle and wet the ground before the events and prevent too much

dust being raised by the running horses. An enlarged part from Figure (73) is given in Figure (74). It shows *Tell al 'Ulayik* and the racing arena which was formed from three racing courses; the watercourse of *al- Mutawakkil* main scheme is not shown as it was in the form of *Kariz* and the full description of the racing arena and *Tell al 'Ulayik* are given in reference ⁽⁶⁾.

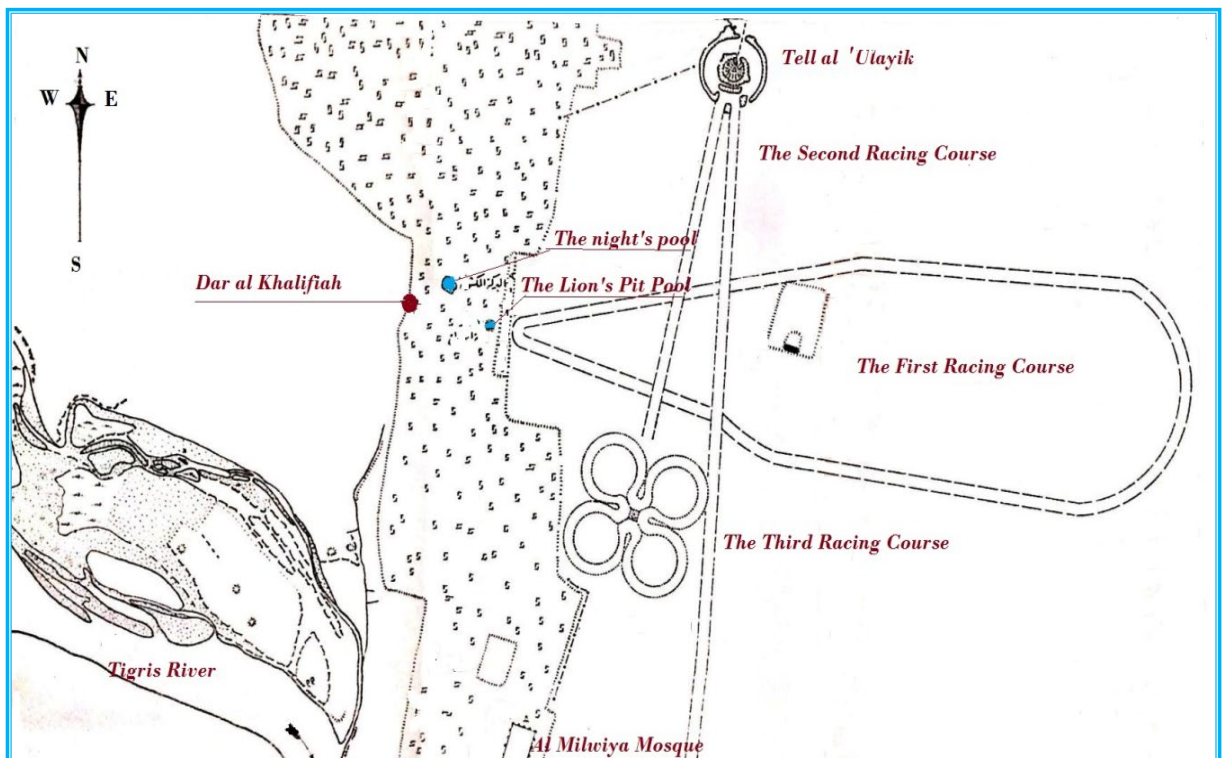


Figure 74: *Tell al 'Ulayik* and the racing arena formed of three racing courses; the watercourse of *al- Mutawakkil* main scheme is not shown .Note the location of *Dar al- Khalifah* and the water pools on the left, and the *Milwiya congregational Mosque* at the bottom⁽⁶⁾

One interesting story which was circulated those days on the origin of the name of *Tell al- 'Ulayik* had said that it was meant to show the power of *al- Mutawakkil* and the great number of horsemen in his army in that, the *Khalifah* had ordered each one of his 90,000 horsemen to carry one full saddle bag (*'Ulayika*) of earth to

the site of the *Tell* (mound). Therefore, it was built from all the earth that was carried by those '*Ulayikas* ⁽⁶⁾.

As the main watercourse continued its way downwards, it passed on the east side of *Dar al- Khalifah* which was the *Khalifah* palace and his normal residence. Through a branch, *Kariz* water was poured in a peculiar pond, which was, located about 600 meters southeast of the palace; it was called by many names such as *al- Zindan*, or *al- Hayba*, but it was commonly known by the name of the *lion's pit*.

This pond was excavated in petrified conglomerate in the form of a square measuring about 20 meters on each side and had a depth of about 10 meters. At the bottom of this pit, a circular pool was dug and filled with water from the branch *Kariz*, and the excess water was then guided into another *Kariz* to be drained into the Tigris and prevent water from over flooding the pit. The pit itself had large recesses in the shape of rooms excavated in the walls and overlooked the pond.

For relaxation The *Khalifah* and his entourage may have used these rooms after swimming in the pool during the burning heat of summer days while enjoying the cool air inside the pit. Speculations go as to saying that the pit was probably roofed to shelter it from the sun and to be like a cellar or crypt. The entrance to the pit was through a gallery in the form of a descending staircase, which opened to the recess in the fourth side of the pit.

This pool, it seems, was not enough for *al- Mutawakkil*, for he needed an open-air pool to spend the evenings and part of the night by

it; and therefore, a second pool was dug, which was bigger than the first and deeper. It was excavated in petrified conglomerate also and was circular in shape with a diameter of about 115 meters, and it was supplied with water drawn through one more *Kariz* and fed from the first pool.

As this pool being used during evenings, it was therefore called the night pool. From the main scheme, one more *Kariz* supplied water to the grand congregational mosque known as “*Abu Dulaf Mosque*” which was one of the famous construction works of *al- Mutawakkil*. This mosque had one 52 meters high spiral minaret known today as the “*al- Malwiya*” which is still in existence and visited by many people, Figure (75).

The mosque had a very large fountain located in the center of the spacious courtyard and it was mentioned by *al-Ya'qubi* as “*the constantly flowing fountain*” ⁽¹⁶⁾. It was in the form of an elevated cup made of one piece of marble and named the (*Firau'n's Cup*) or the (*Pharaoh's Cup*) due to its large size and streamlined form ⁽¹⁷⁾. Water over flowed from the cup into a circular basin which measured 23 *dira'* or (12.43 m) in diameter ⁽¹⁸⁾. The cup itself was raised on a circular base in the center of the basin and elevated to a height of 7 *dira'* (3.79 m) and it had a thickness of one half *dira'* (0. 27 m). The basin itself was built from masonry of brickwork bonded by lime and ash and engraved with Islamic motifs and decorations in gold color mosaics and colored glass. The whole arrangement suggests that a closed conduit under pressure supplied the flow.

In 1911- 1912, the site of the mosque was excavated by the German Archaeological Expedition headed by Dr. Herzfeld, and a lot of marble blocks and other ornamental parts made from gypsum were unearthed from around the fountain⁽¹⁸⁾.

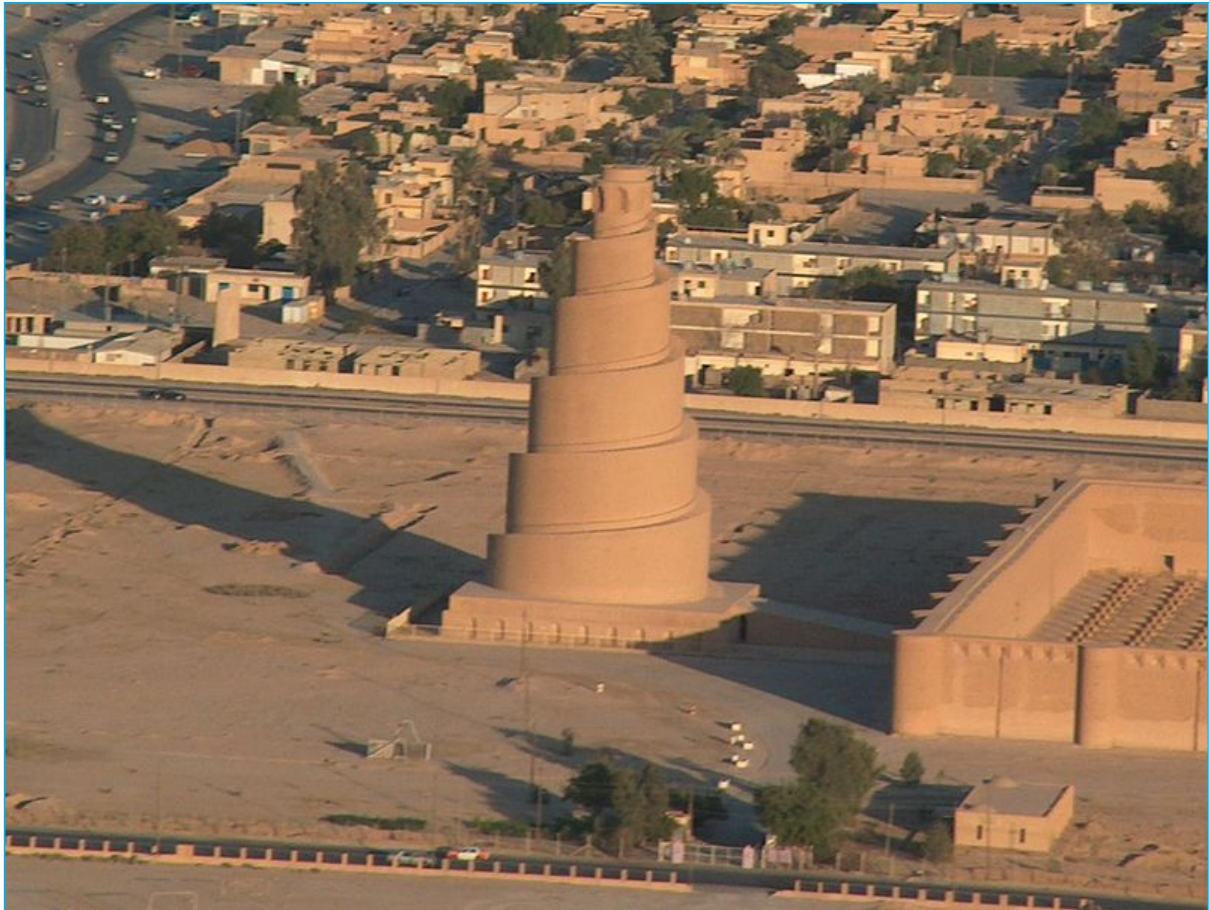


Figure 75: A recent photograph of al- Malwiya minaret of the Abu Dulaf congregational mosque built by Khalifah al- Mutawakkil during 848- 851

The *Kariz* watercourse continued towards *al- Matira*, a small village about two farsakh (12 km) south of *Samarra*, which was located on the Tigris after supplying water to all these important locations. *Al-Matira* was *qati'a* that was originally given by *al-Mu'tasim* to his general *al-Afshin* where he had built his residence, a small market, as well as a mosque and baths. But following *al-Afshin*

execution in 841, *al- Matira* was granted to the *Turkish* general *Wasif* by the *Khalifah al-Wathiq*, *al-Mutawakkil's* father ⁽¹⁹⁾.

From *al- Matira* the *stream* continued in its courses to pour the remaining flow into the *al- Qaim* which was the feeder canal of the *Nahrawn Grand* canal, as shown on the map in Figure (76).

This map also shows clearly that *al-Mutawakkil canal* ended below *al- Hayr*, and it could not possibly supply it with water due to the opposite grade of the land; and the case being so *al-Hayr* reserve had to be irrigated by another canal, which was excavated by *al-Mutawakkil* and called *Nahr Nyzak*.

The *Khalifah al- Mu'tasim's Hayr* mentioned previously was called by *al-Ya'qubi* as *Haier al- Hayr* to differentiate it from *al-Mutawakkil's Hayer* ⁽²⁰⁾. In fact, *Haier al- Haier* had occupied only the 100 hectares of land east of the congregational mosque, at the southwestern corner of *al- Mutawakkil Hayr*, but *Al- Mutawakkil's* plan, in fact, was to use most of the plain south from the *Katul Kisrawi* down to the *Nahrawn* feeder *al- Qaim Canal* (which had been re- excavated by *Khalifah Harun al- Rashid* who had renamed it as *Nahr Abul el- Jund* after he closed the intake of *al- Qawrach* (refer to chapter 9).

The area of *al- Mutawakkil's Hayr* was about 5000 hectares; which he surrounded by a mud brick wall, and then released inside it wild animals and birds such as doers, gazelles, and ostriches, but predators such as lions and the like were kept in cages in a small enclosed area.

The problem, which had faced *al- Mutawakkil* in the beginning, was his intention to irrigate the *al-Hayr* by re-excavating the old *al-Qadisiyya canal*. This canal branched from the *Katul Kisrawi* and it was originally intended to bring water to *al- Qadisiyya fort* (the Octagon) where *Khalifah Harun al- Rashid* had started to build a palace he had called *al- Mubarak* but left it unfinished⁽²¹⁾. *Al-Mutawakkil* found out, however, that *al- Qadisiyya canal* intake had silted up completely. Moreover, it could not irrigate the whole *al-Hayr* area during summer, therefore, he decided on a completely new solution by building a cross regulator on the *Katul* at kilometer 30 to raise the water level and feed a new canal he excavated commanding the whole area. The remnant of the canal intake structure is still visible today, which reveals its four openings; and it shows that it was of the same masonry construction that was used those days in similar structures.

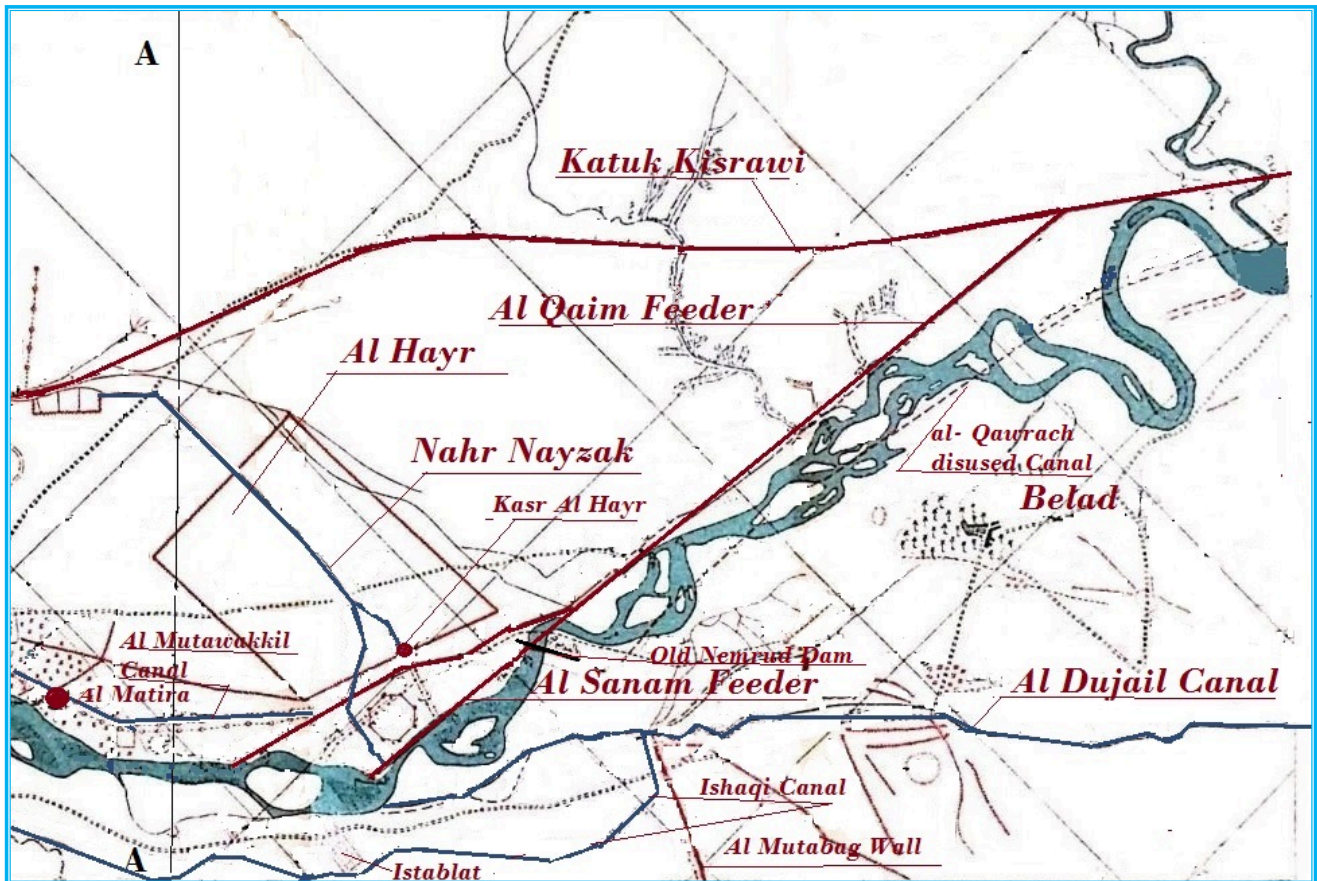


Figure 76: Map showing the finishing point of *al- Mutawakkil* canal, *al- Hayr*, *Nahr Nyzak*. Also are shown *Al- Ishaqi Canal* and *al- Dujail* canals at the lower part of the map. (Note the matching line A-A in this map with the same in the map of Figure (73).

The construction work was completed in the dry on the right side of the *Katul* before the flow was diverted into it once construction was complete. The new canal, which *al- Mutawakkil* called the *Nahr Nyzak* (*Meteor*) ran for the first two kilometers parallel to the *Katul* before it turned towards the south for another 14.5 kilometers going through the whole *Hayr*; but as the course of *Nahr Nyzak* approached the lower boundary of *al- Hayr*, it gave one branch, which supplied another of *al-Mutawakkil* ponds that was called “*Al Burka Al- Ja’fariyya*”.

Here the *Khalifah* had built another palace and called it *Kasr al-Hayr*; a spacious palace of 20000 square meters overlooking the pond, which was in the form of square with an area of 40,000 square meters. The pond was mentioned in the poems of *al- Buhturi*, who was one of the most famous poets of the time who compared it to a “Beautiful Lady” ⁽²²⁾. *Nahr Nyzak* itself ended in the Tigris River.

In reality, *al- Mutawakkil* construction of these canals was not out of his desire for development of agriculture and expanding cultivable lands, as it was the case for all the previous Kings and *Khalifahs*. It was out of personal fancies and selfish desires and whims to own large number of palaces and ponds and devote them for entertainment and pleasure. *Yaqut al- Hamawi* in his *Mu'jam al- Buldan* (Book of Countries) lists about 19 palaces, which *al- Mutawakkil* had built. He spent more than two hundreds and ninety four million dirham on their construction ⁽²³⁾. As if this entire building spree was not enough to satisfy his aspirations and vanity, so he began the building of a new city in 859 and moved to it in 860 which he named *al Mutawakkiliyya*, that was also called by some authors *al- Ja'fariyya* in reference to his new palace there which he had called *al- Ja'fari*, and since his full name was *Abu al- Fadhl Ja 'far al- Mutawakkil*.

The location of the new city was about three *farsakh* (about 18 km) north of *Samarra* at a place called *al-Mahuza*, between the Tigris River and the right bank of that part of the *Katul Kisrawi* known today as *Al Russasi Canal*. In addition to his new palace, *al- Mutawakkil* built new government offices, a new congregational

mosque similar to the one he had previously built in *Samarra*, and distributed *qati'as* of land to his sons, army generals and soldiers, officials and many others to build residences for themselves.

Then he surrounded the city with a wall but keeping his palace outside this wall on the bank of the Tigris River. To supply the new city with water, he ordered the excavation of a new canal which he called *Nahr al Ja'fari*. The intake of this canal was on the Tigris River some forty kilometer north of Tikrit, and it followed a course parallel to the river for about sixty kilometers before it crossed the *Katul Kisrawi (al Russasi Canal)* by an aqueduct and then entered the city.

The work was entrusted to two courtiers who ignored the talents of a local engineer and gave the work to *Abu al- Abbas ibn Mohammad ibn kuthyer al Farghani*, an astronomer and writer but not much of a specialist in such works. His calculations of the grade of the canal proved to be wrong, and it turned that the excavation of the canal should be much deeper than calculated in order to have enough flow going through it. The work could not go any further by deepening the excavation due to the nature of the ground, which was of very hard conglomerates.

The project proved to be a big failure and therefore, was called off after spending one million Dinar or 25 million dirham; one dinar being equivalent to 25 dirhams in the days of *al- Mutawakkil* ^{(24),(25)}.

Al- Mutawakkil, far from being pious *Khalifah* as would be expected from all *Khalifahs*, was sunk in debauchery and habitual

drinking, and as described by one writer he was the “Nero of the Arabs”⁽²⁶⁾ in reference to his policies towards non-Muslim minorities. Moreover, most historians consider his reign as the beginning of the decline of the State of *al- Khilafa*, which was marked sharply by the deterioration of its economy. His extravagant attitude was the subject of talk between the people of the time who were saying, “What was saved by *al-Ma'mun*, *al-Mu'tasim* and *al-Wathiq* was wasted completely by *al- Mutawakkil*”.

This spending and the noticeable decrease in the *Kharaj* collection during this time marked a sharp decline in agriculture, which formed the main source for this *Karaj*.

Up to this period, all the previous rulers of Mesopotamia, including the recent *Khalifahs* had saved no effort or expenditure in maintaining the large and complex irrigation system of *al- Sawad* land, but this did not happen during this time, which had marked a period of carelessness and neglect.

Therefore, *al- Mutawakkil* was not responsible only for wasting the public treasury but also for putting to waste all the hard work and toil to build and preserve this system from the times of the *Sumerians* up to this time.

The conduct of *Khalifah al- Mutawakkil* was abhorred by his son *al- Muntassir* to such an extent that he conspired with his *Turk* guards to kill his father in his own chamber after ruling for only fifteen years. This act, however, ushered a bloody period of tampering in the affairs of the *Khilafa* by those *Turks* and caused anarchy. For apart from the

assassination of the *Khalifah*, this led to armed strife between his two sons, *Al- Muntasir* (861- 862) and *al- Mu'tazz* (866- 869). It was followed by the fighting between *al- Mu'tazz* and his uncle *al- Musta'in* (862- 866) which was instigated by the *Turks*, so out of the five *Khalifahs* that reigned in *Samarra*, before the seat of government was returned to Baghdad by *al-Mu'tadid* (892- 902), three of the *Khalifahs* were killed or deposed by the *Turks*.

The weakening *Khalifah* during this period encouraged revolts and uprisings such as the *Zanj* (slaves) revolt and the *Qarmathians* mutiny, so the central government was completely preoccupied by putting down these disturbances and lacked enough resources to carry out public works, including the up keeping of the irrigation networks. The resulting conditions influenced agriculture, on the one hand, and caused far reaching results on the future of these systems on the other.

These conflicts in many instances caused also acts of deliberate sabotage on the banks of the canals and rivers for the use of water to obstruct the enemy and hinder the troops advance. Such case was recorded during the fight between *al- Musta'in* and *al- Mu'tazz* after the first had fled to Baghdad and was besieged there, whereby he ordered the flooding of two extensive tracts of land by breaching canals. This action drove the farmers out of their lands and resulted in extensive damage to their crops and the loss of their cattle. The continued state of negligence towards agriculture and irrigation works during the reign of all of the following *Khalifahs*, except in one or two cases, contributed among other things to irreversible damages to

the irrigation systems and caused a sharp decline of agriculture. Moreover, the arbitrary collection of heavy taxes from the farmers under the weight of the high cost of these fights sustained and deepened this trend ⁽²⁷⁾.

It is not surprising; therefore, to learn from the writings of the thirteenth century authors that major irrigation works such as the *Nimrud Dam*, the *Nahrawn* great canal system were either extinct or were nearly ruined when the final blow to the irrigation system came on the hands of the Mongols in their invasion of Iraq and destruction of Baghdad in 1258.

In an exceptional case, one important irrigation system remained functioning during these difficult times. This was *Nahr al- Dujail* and its network. In fact, *Nahr Dujail* had dated long time before the building of *Sammara* by *Khalifah al- Mu'tasim*. It was located on the right bank of the Tigris River and irrigated the land west of the Tigris in the districts extending from Balad, not that far downstream from *Samarra*, down to the northern quarters of western Baghdad. Its intake was on the right bank of the Tigris River about 10 kilometers northwest of Balad and seven kilometers south east of *al- Qadisiyya* fort, close to the old town called *al- Alath*, (refer back to Figure (76)).

The construction of the canal is believed to be one of the works of the *Sassanid* King *Kosrow Anushirwan*, who at the same time had dug the *al- Qawrach* canal on the left bank of the Tigris to replace *Nahr al- Qaim*, which fed the *Nahrawn Canal*, (see Chapter 9). The water level of the Tigris was raised during summer by constructing a

stone weir across the Tigris to feed *Nahr al- Qawrach* and *Nahr Dujail* together with many other smaller canals.

Nahr al- Dujail ran for five kilometers to the south down from its intake before it divided into two branches. The southwesterly branch had previously continued on its course and irrigated the lands to the left of River Euphrates until it disappeared close to the modern Saqlawiya canal which off takes from the Euphrates fourteen kilometers north of Falluja, but at the *Abbasid time*, this branch was already abandoned.

The second branch flowed southward and was called during the *Abbasid* period by *Nahr Batatiya*, which headed towards a small town known until recent times by the name of *Sumayka*, which took later on the name of *Dujail*. In those days *Nahr Batatiya* irrigated the districts north of Baghdad known as *Tusuj Maskin* and then *Tusuj Katrabbul* before it entered the northern district of western Baghdad known as *al- Harbbiyyah* quarter where it became part of the canal network supplying the city and irrigated it by its numerous watercourses which it gave there.

Ibn Serapion described *Nahr al- Dujail* in his manuscript “*Description of Mesopotamia and Baghdad*” which he wrote about the year 900 AD, translated, and edited by LeStrange, where he described in section (V) *Nahr al- Dujail* as:

“a canal which was taken from the Tigris River; its beginning was a league or two more above the village of Ar-Aabb., which then it passed cross-wise, and from it branched many canals that watered the

domains of Maskin and Katrabull, and the hamlets pertaining thereto, and finally it poured into the Tigris between 'Akbara and Baghdad.

In section (XIL) of the same manuscript, *Ibn Serapion* gave more details on the canal system, which supplied al- *Harbbiyyah* quarter. He specifically mentioned the *Nahr Batatiya* branch that was brought from the *Dujail* and had its origin at six leagues below the head of the *Nahr Dujail* itself; after watering many domains and villages it went by the midst of the district *Maskin* and flowed out to the northern quarters of Baghdad; He went on to say;

“From the Batatiya canal many branches were taken off, The first one branched at a point below the Bridge of- Boats , flowed then through the conduit of the Kuraj at the Bridge of the Gate of Anbar and ran then passing along the road of al- Kabish where it disappeared.

The second branch was taken from the main Batatiya canal at a point below the offtake of the first branch and ran into the city and passed over the Trench of Tahir by an aqueduct called 'Abbarat al- Kukh to continue afterwards down the road of Dujail towards the Quadrangle of the Persian (Murabba'at al- Furs) and here it gave a tertiary branch which continued under the name of Nahr al- Dukkan- al- Ibna to disappear afterwards further down.

The main canal, however, after skirting the Quadrangle of the Persians reached to the Bridge of Abu- I- Jwan, and at this point it gave a third branch which headed towards the place of the Scribe for Orphans, and thence to the Quadrangle called Murabba'at Shabib

where it poured out into the canal of the road near the Syrian Gate. As the main canal continued from Bridge of Abu- I- Jwan it reached the Palace (Kasr) Hani and after passing it ran to the garden called Bustan al- Kass, and finally poured out into the canal which had passed down to the road of the Kataba's" (28).

During the thirteen century, the Tigris River flooded many times. Some of these floods were exceptionally severe, the high flows caused much destruction along its banks, and it is believed that the floods of 1225 and 1242 could have been behind the change of the Tigris River course from its original course to an easterly one where it remained there until the present days (Figure77). However, this had also caused marked changes on the landscape and the irrigation systems, which had served the area.

This change of the river course left the towns of *al- 'Alath, Harbi, Balad, Al- Hadhera, and 'Akbara* in the western side of the new course, whereas they were on the eastern side of the original course before. This event caused in depriving these towns from their original water supply and led *Khalifah al- 'Mustansir* (1226- 1242) to relocate the intake of *Nahr- Al- Dujail* upstream from its original intake to a point south of *Istablat* opposite to *al-Qadisiyya* (see Figure (76), and at the same time he opened many new branch canals to supply these towns. Moreover, he enlarged the *Batatiya* branch and increased its flow to take care of the newly added requirements.

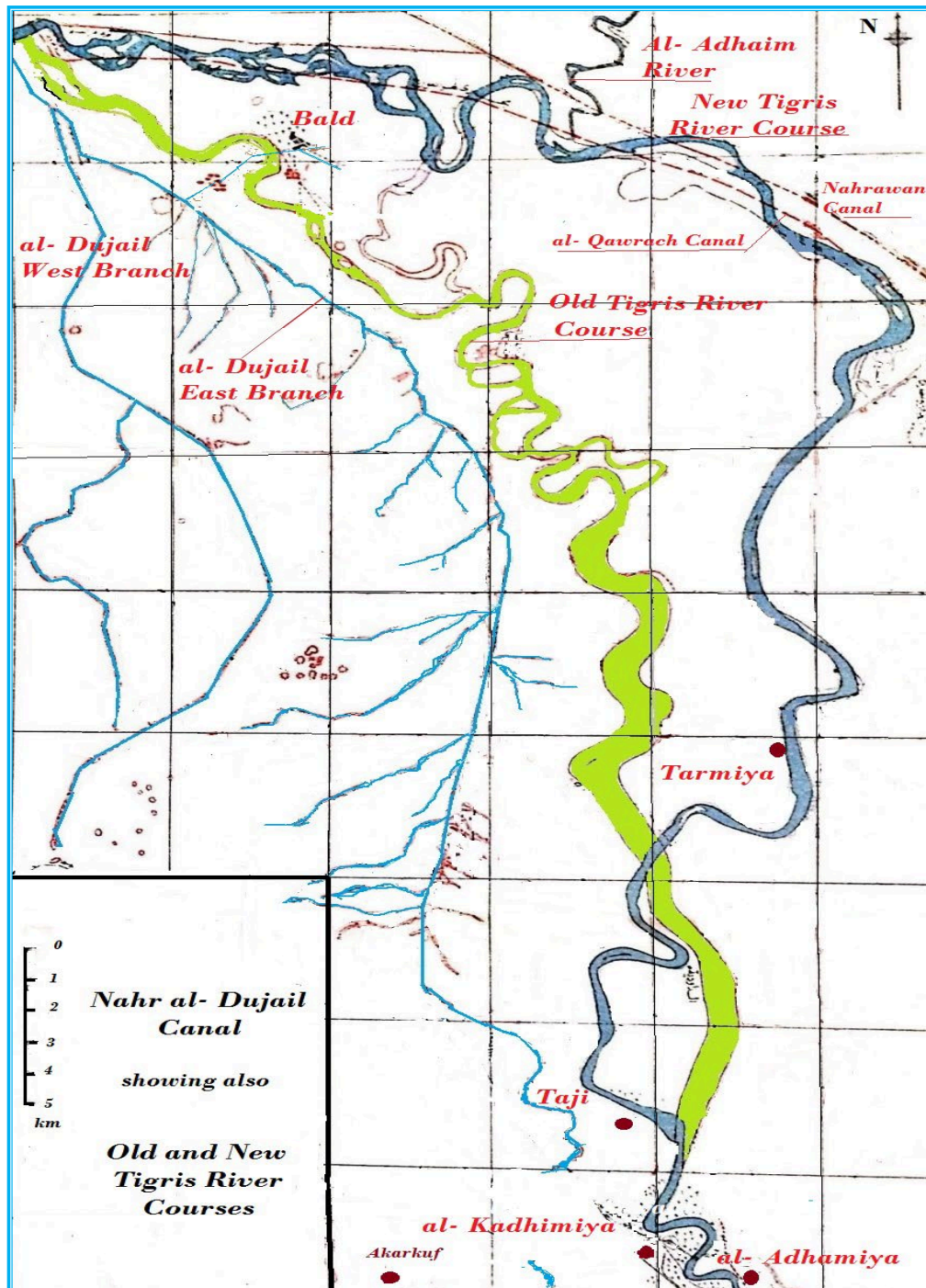


Figure 77: Map showing *Nahr al-Dujail* and its two branches, the old course of the Tigris River (green) before it changed in the thirteen century to the present day's course (blue). Moreover, the location of the modern town of Balad, the two modern districts of Bagdad, *al-Kadhimiya* and *al-Adhamiya* are shown.

In the fourteen century *Nahr Dujail* was mentioned by the famous Muslim scholar and explorer *Ibn Battuta* (1304- 1369) in his book of travels; where he stated that when he decided to visit Mosul

and Diar Bakr further north, he took the caravan from Baghdad which followed the *Dujail* canal from its end at *Harbiyah* quarter. He reported that the caravan followed the road alongside the canal which, as he said, was derived from the Tigris and watered a large number of villages, which were located in a wide and fertile tract.

Ibn Battuta went on to say that after two days of riding, they arrived to a large village that was called (*Harbi*) in the district of *Maskin* where the caravan made a stop. It took them another two days to reach close to the *Ma'ashuk* (al Ashiq) fort opposite to Samarra on the other side of the river ⁽²⁹⁾.

Nahr al- Dujail survived the events that followed the fall of Baghdad in 1258 and the wide spread intentional destruction of the canal networks in the aftermath on the hands of the Mongols. Nevertheless, the fact remains that these networks had already suffered at that time from considerable deterioration and damage since the days after *Khalifah al- Mutawakkil*.

Nahr Dujail continued to serve its purpose until the 1960s when it was replaced by a modern canal system that expanded the original irrigated area considerably.

This new system is known today as the *Ishaqi Irrigation Project*, borrowing the name from the *old Ishaqi Canal* which is not related to it. The head regulator of the present project is incorporated in the modern *Samarra Barrage* completed in 1956, which serves irrigation and power generation purposes but above all saving Baghdad from

the Tigris River destructive floods by diverting these floods to the Tharthar depression.

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The Decline

Mesopotamia or the land between the two rivers, Tigris and Euphrates, was the gift of those two rivers, which was formed during thousands, if not millions of years, by the natural sedimentation processes of the silts, and sediments they carried down from the rigorous mountain regions at the north. This virgin and fertile land had become, therefore, the object of industrious and hardworking peoples that immigrated and settled in its plains and laid down the foundation of the first civilization in the history of the world.

Great civilizations flourished here one after the other since the city state civilization of *Sumer and Akkad* some 3500 year BC and continued uninterrupted for so many thousand years afterwards. This fertile land when properly irrigated and managed could bring abundance of profit to those who owned it and worked on it. The abundant water of the two rivers, however, if mismanaged, could also become the reason for deterioration of the land and the decline of the social communities that lived here. This fact was taken in well by those nations who governed this land, and so they spared no effort in developing methods of irrigation and means of cultivation, which were best suited to the prevailing natural conditions, and worked out flood protection measures to enhance their safety.

Lower and middle Mesopotamia belonged to the semi-arid region in which rainfall alone could not support the intensive agriculture practiced there, but this was made possible by constructing very intricate and laborious irrigation systems for supplying the water

needed. Moreover, the nature of the two rivers which could bring about destructive floods made the people versed in ways and means to harness their flooding, or when efforts failed and the land was inundated, they had the patience and persistence to re-build what had been destroyed and start all over again.

These peoples knew well that their livelihood was in preserving these irrigation systems and keeping them in good working conditions. Maintenance of irrigation canals and keeping them free from silt was a duty of the governors and their folks that persevered in doing this in a sense of religious duty as to keep their gods and deities happy and satisfied with them.

Devising the fallow cultivation system was another thing that they had discovered to keep salinity of the land within acceptable limits to sustain production. In addition, even interchanging the types of the crop, whether wheat, barley or any other crop they had practiced keeping the land productive.

The civilization of Mesopotamia, was hydraulic civilization which needed constant care and looking after, and it needed political stability and continuous investment. The long history of agriculture and irrigation system in Mesopotamia shows that apart from short periods of wars or rivers changing courses, agriculture continued to flourish and reached its peak under the *Persian Sassanids* empire (224- 621 AD) and continued in the same tempo even after the *Persian's* defeat by the Arabs. The victorious invaders preserved the tax and administration policies of the *Sassanids* and enjoyed

remarkable successes for the next two and a half centuries. Baghdad was founded and became the center of the Golden Age of Islam in the 8th and 9th centuries at the time when the empire had reached its climax and enjoyed the accumulated wealth brought about by these policies. But by the middle of the 10th century, the irrigation system started to deteriorate following a slow trend of decline that had begun already some time before. Something had gone wrong, which impacted the whole production cycle and doomed the whole process to failure and even resulted in the depopulation of southern Iraq⁽¹⁾. In exploring the reasons for this failure, it does not take much time to discover that this was a direct result from the diminished central power of the State, which could previously put things in the right order and avoid any mismanagement.

In his book “The Fate of Empires and Search for survival,” Sir John Glubb attempted to analyze the reasons behind the fall of eleven of the world great empires from 859 BC to 1950. By comparison, he concluded that the average life span of those empires did not exceed 250 years counted from their birth to their decline, which, more or less corresponds to an average of ten generations; if the time span of one human generation is taken to be 25 years. In this, he recognized that small nations, suddenly emerging from their homelands, had overran large regions of the world and conquered old established empires fueled by spontaneous vigor. The Arabs did this in the seventh century, and the Macedonians had done it before them in fourth century BC. By striking similitude, the Macedonian Empire

lasted for 231 years while the Arab Empire lasted 246 years before actual power went into the hands of foreigners. As in many cases that are similar, those outbursts were characterized by strong display of energy and courage. The decaying empires, which they overthrew, were wealthy but defensive- minded. Their old legions had lost their stamina and became passive defenders. The new comers found their rewards in the booty and wealth left to them ⁽²⁾. New empires followed the old once but only to fall in to decay in the same stages endured by the previous once.

Fall of empires in most cases had occurred, not by the declining of their military power only but also by the deterioration of their economy and social fabric. The decline of agriculture and the collapse of Mesopotamia's thousands year old irrigation system in the second period of the *Abbasid Khilafa*, must be viewed in this context.

It follows; therefore, that in any meaningful research about the fall of the *Abbasids* it must give a clear picture of the political and social background that had prevailed at that time, and should follow the historical sequence of events, especially those related to the *Khalifahs* as they were the major actors in this history.

In speaking of the Arab Empire, the beginning was marked after the death of the Prophet Mohammad (632AD), and the start of its decline was observed by the assassination of *Al- Mutawakkil* in 861 during the *Abbasid* period. The fall and the loss of this empire was a natural end to the stages normally experienced by all the other empires as mentioned already. First, was a stage of pioneering and

military might, which was crowned by the extension of the empire's boundaries as in the time of *Abbasid Khalifah al- Mansur*, Second, a stage of active building and construction, successful agriculture, flourishing arts and intellectual achievements, booming commerce and thriving economy leading the way to luxury and accumulation of wealth as it was in the reign of the *Khalifah Harun al- Rashid*. But this affluence led to the third stage; the gradual moral degeneration of the *Khalifes* and their subjects which became evident in the time of *al- Mu'tasim* and *al- Mutawakkil* with their tendency to buy security by recruiting foreign *Mamluks*.

To understand fully how things led to the fall of the *Abbasid Khilafa*; the real reasons must be identified and the weakness points should be diagnosed first in order to have a clear picture of the whole processes. This is the subject matter of this chapter, which is based on exposing the relevant events in chronological sequence from the beginning to the end.

On the death of *Harun al- Rashid*, the first conflict over the thrown in the history of the *Khilafa* occurred between his two sons, *al- Amen* and *al-Ma'mun*, which caused the first civil war and gave the non Arab military, forces a bigger role in the administration of the empire. Although the war ended in favor of *al- Ma'mun*, the role of the non-Arab military forces was strengthened, and it was even intensified during the reign of the next *Khalifah* of *al-Mu'tasim*. This state of affairs continued to be the case during the time of the following *Khilafa al- Mutawakkil*, when the commanders of the

powerful *Turk ghilmān* elite force had the upper hand in running the State's affairs.

The Arab Empire lost its Arabic identity by the death of *al-Mutawakkil*, and the actual power slipped into the hands of the *Turks ghilmān* first, and later on into the hands of the *Persian Buwayhids*, and later on still in the hands of the *Seljuks*.

Except for very short periods during the remaining life of the *Abbasids* dynasty, the *Khalifahs* were reduced to mere religious figureheads while internal fighting and conflicts for power had dominated the scene. The loss of a strong central power resulted in anarchy, which did not only encourage the various regions of the empire to break away, but even stirred many internal wars in the core of the empire which had taken its toll on Iraq's *al-Sawad* prosperity and its revenue to the treasury. The declining revenue meant that all the irrigation systems were left without maintenance. Cultivated land area gradually turned to barren land inflicted with silt and salts and agriculture was reduced considerably creating less and less cash flow to the State's treasury.

Conflicts and revolts within Iraq *al-Sawad* and elsewhere in the empire worked in a most negative and severe way into the gradual crumbling of the economy and the social fabric. The weakening economy and loss of revenue were aggravated by mismanagement of the tax policies, using tax farming (*dhaman*) system. The manipulation of land ownership through (*military Iqta'*) to win the favor of the officers meant the disruption of the agrarian relations,

which had prevailed previously and proved their value. The corruption that had spread within the hierarchy of the government officials, and tax collection agents worked into more dwindling revenue to the State. The inevitable consequence was the stark neglect of public services of which irrigation system maintenance was a major cost item. It also meant that rehabilitation of damaged systems after wars and conflicts was not performed due either to the large extent of the damage inflicted, or the unavailability of the required funds, and the lack of the will to do so.

The decline in agriculture came as the reasonable result to be expected and its output decreased steadily due to the shrinkage of the cultivated land area, which was mostly laid in waste after civil wars or destructive floods and the displacement and immigration of the farmers from the affected areas. These changes were irreversible and the agriculture, which had been the stable base upon which this empire, and all the previous ones had rested, was no longer able to support it.

The high dignity of *al- Khilafa* and its respect among the people were damaged by the unbalanced behavior of *al- Mutawakkil* (847-861). His extravagances brought the famous remark “what *al- Ma'mun*, *al-Mu'tasim*, and *al-Wathiq* had accumulated, *al- Mutawakkil* wasted completely”⁽³⁾. His apparent piety and adherence to Islam was contradicted by his indulgence in drinking, entertainments and pleasures. His actions in matters of faith damaged his role as *Khalifah* as an unbiased patron for all the faithful; and by

instituting policies against Shi'a, Christians and Jews, he risked alienating large groups of his subjects. Finally, his attempt to scale down the power and influence of the *Turk ghilmān* officers and palace ministers backfired and made him even more isolated and subjugated to them⁽⁴⁾.

On December 11, 861 *al- Mutawakkil* was assassinated. When being intoxicated of too much wine, he insulted his older son *al- Muntasir* openly and over- abused him. As *al- Muntasir* angrily left the *Khalifah's* chamber, a band of the *Turk* guards rushed in led by their leader *Bugha* and slew the drunken *Khalifah* and his confidant *al- Fath ibn Khaqan*, who was being entertained with him. Immediately on the scene *al- Muntasir* was proclaimed as the new *Khalifah*⁽⁵⁾.

Most historians link *al- Muntasir* to the assassination of his father on the ground that this was the natural outcome of *al- Mutawakkil's* favoring his younger son *al- Mu'tazz* over him, and the fear that he was about to shift the succession of the throne to him.

The assassination of *al- Mutawakkil* was a momentous event in the history of the *Abbasid Khilafa*. It marked the beginning of open military intervention in politics and led the way to more palace intrigues and coup d'état changes of the *Khalifahs* who became in most cases only puppets in the hands of the *Turk* commanders. During the next 31 years, from 861 to 892, the *Turks* installed five *Khalifahs* and assassinated three of them.

The *Turk* ranks and files were, in their origin, slaves from the eastern steppes, whereas their commanders were generally free men of aristocratic or royal lineage. In the *Abbasid* army, there were also units of free soldiers from the Islamic west (*Maghariba*) and central Asia (*Faraghina*). Relations between commanders and soldiers were far from easy. The commanders, moreover, did not constitute a unified group among themselves. This meant that there were elements, which opposed the murder of *al- Mutawakkil*, who readily organized resistance against the conspirators in an attempt to change the outcome in favour of *al-Mu'tazz*. The other faction led by *Wasif*, who backed *al- Muntasir*, thwarted the attempt; so, *Wasif* and the new Wazir *Ibn al- Khasib* dominated the scene for a while.

When *al- Muntasir* died under suspicious circumstances after only six months, the commanders selected a new *Khalifah*, *al- Musta'in*, who was *al- Muntasir* uncle. Then the new *Khalifah* himself came under strong pressures from the same commanders, which led him to flee to Baghdad. Civil war erupted for the second time in the history of *al-Khilafa*, but now, in 685, between, *al- Musta'in* and *al-Mu'tazz* whose forces besieged Baghdad. The fight was not between *Turks* and *non-Turks*, as *Al- Mu'tazz* partisans included both *Turks*, and *Maghariba* and the situation was much the same for *al- Musta'in* side in Baghdad. The conflict, which had lasted ten months, had its repercussions on the population in both of the two cities, Baghdad and Sammara, in addition to the countryside as both

conflicting parties tried to inflict greater damages on the other side causing much hardship to the people.

According to *al- Tabari*; *al-Musta'in* while in Baghdad asked all the governors of the other cities and regions to stop food supplies from reaching *Samarra*. At the same time, he ordered them to forward the *Kharaj* money to him in Baghdad. *Al- Musta'in* in defending Baghdad oversaw the strengthening of the walls of the city and ordered the digging of moats and construction of shelters for the cavalry and building various bastions and obstacles to prevent the attacking force from entering the city. The total cost of these works amounted to three hundred and thirty thousand dinars, while at the same time he ordered the breaching of irrigation canals and the destruction of the control structures in the *Tusuj* of *al- Anbar* and *Baduraya* to flood the land and hinder the enemy's advance from that direction. The war resulted in shortage of food and soaring prices so that one *kafez* of wheat was sold for 100 dirhams⁽⁶⁾, (one *kafez* is equivalent to eight *ratls*; and one *ratl* is equal to about 406.26 gram so one *kafez* is about 3, 25 kg).

The situation at the end cleared in favor of *al- Mu'tazz* who became then the new *Khalifah* in *Samarra* while *al- Musta'in* was banished to *Wasit* where he was found shortly afterwards mysteriously dead. This period was very harsh on the population and hit their living resources, such as agriculture, very badly. Even the commanders of the army found themselves in a bad position by being unable to pay the salaries of their soldiers. Therefore, they blamed the

Khalifah for this failure and instigated those soldiers to march to the palace and seize the *Khalifah*. After deposing him from *al- Khilafa*, they kept him imprisoned for three days without food or drink and finally they buried him alive in a newly plastered tight crypt⁽⁷⁾.

The reign of the next *Khalifah al-Muhtadi* (869- 870) was not any better from that of the previous one, and when he tried to limit the powers of the commander *Musa ibn Bugha*, he was killed by angry soldiers who demanded the replacement of the *Turks* commanders and the corrupt officials who had plundered the treasury. Their demands extended to call for the restoration of good order, the reform of the tax collection system and abolition of the abuses that impacted the *Kharaj* lands and estates by awarding of concessions of land (*qati'as*) to the officers⁽⁸⁾. These demands give us first evidence that awarding (*qati'as*) to the officers of the army were practiced at that time; something, which was rare at this time and would become widespread in *Al- Sawad* under the *Buwayhids* and *Seljuk's* rules throughout the Islamic world⁽⁹⁾.

In the troubled years following, the death of *al-Muntasir* in (862), the governors of the provinces gradually turned themselves into feudal vassals and the supremacy of the *Khalifah* shrunk into a more or less a symbolic status. In Tabaristan, in the Caspian Sea region, the *Tahirid* dynasty that held their court in *Nishapur* had already established themselves outside from the *Khalifah's* authority in (864). Similarly, the *Hamdanid* dynasty (890- 1004) had their autonomous

state in northern Iraq and Syria in the Jazira region and had their capital in Mosul.

By (870) when *Khalifah Al Mu'tamid* rose to the throne of *al-Khilafa*, the famous *Yacoub ibn Laith*, the *Coppersmith*, and the founder of the *Suffaride* dynasty who had commenced his life as a common soldier, conquered *Sijistan* from the *Tahirides* and in (873) he took over *Khurasan* and gradually extended his power over the whole of *Persia*. The period which marked the reign of *al-Mu'tamid* (870- 892) was not any better from the previous one. This *Khalifah* was very weak, and the actual power was in the hands of his brother *al-Muwaffaq* (died in 891). So, after many encounters with *al-Muwaffaq*, the *Suffaride* leader *ibn Laith* made peace with *al-Mu'tamid* and obtained by a letter patent the free possession of all the country he had occupied. About the same time, *Transoxiana*, known in Arabic sources as *Mā Warā' an-Nahr*, (this name was used for the portion of central Asia that correspond approximately to modern day Uzbekistan, Tajikistan, southern Kyrgyzstan, and southwest Kazakhstan), became virtually independent under *Ismail the Samanid*. It won a similar concession from the *Khalifah*, and the rule became hereditary in his family, subject to the payment of a nominal tribute.

As it was in the eastern domains of *al-Khalifah*, the western regions followed the same trend as in the secession of Egypt as well as much of Syria establishing an autonomous rule in 868 under *Ahmad ibn Tulun* away from the central authority of the *Abbasids*.

Within only thirty years from the death of *al- Mutawakkil* the empire had shrunk considerably due to his short sight and unwise policies, which left considerable discontent in all parts of the *Khilafa* lands, especially in *al- Sawad*, which had formed the hard core of the empire. Losing all the mentioned regions, however, meant less revenue and weaker economy.

In *al-Sawad*, the State had to face one of the most serious and challenging uprisings in its history, which was the slaves (*Zanj*) revolt that had lasted for fourteen years from 869 to 883 and left far reaching impacts on the life of people in the towns of *lower al- Sawad* and its countryside. This rebellion started by attacking villages and estates causing great economic damage and large areas were seized by the rebels while large cities like *Basrah* and *Abadan* were also occupied and destroyed.

The slaves were originally from the *Bantu* people that were captured by the Arab slave traders who tagged them as infidels (*Kuffar*). Those traders had established themselves since (720) in colonies along the coast of east Africa that extended from Lamu in Somalia to Mombasa, Zanzibar and Mozambique in order to hunt for these people and practice this trade, which found a very good market, especially during the *Abbasid* period. They were needed as free working hands in the palaces and in the vast agricultural estates, and in removing the salt from the *Bataih* lands in the south of *al-Sawad*. Here, work was tremendously hard within the swamps, which were covered with bamboo and papyrus and infested with malaria.

Indications show, however, that there were already some of these slaves during the years of *Mus'ab ibn al- Zubair*, who served as governor of *Basrah* from (684 to 691) following the Islamic conquest, and that they had mutinied then and occupied the farms and estates protesting their miserable and inhuman conditions.

The number of those *Zanj* had increased tremendously as a result of the introduction of the *qati'a* system and the need for free hands to cultivate the extensive agricultural areas which were either newly reclaimed or confiscated from the *Sassanid Dahkans* who had left after the Arab conquest. Moreover, the *Zanj* formed also good number of the soldiers in the *Abbasid* army since (749). It was no surprise, therefore, that they had about three hundred thousand fighters when they rose up in rebellion against the State⁽¹⁰⁾.

The uprising of the *Zanj* began in (868) under the leadership of a man called *Ali ibn Mohammad*. He was a free man born in the village called *Warzaneyn* in the *Rayy* district in *Persia* as reported by many authors, but *al- Tabari* wrote that *Ali ibn Mohammad* was from Arab descent^{(11),(12)}. Other historians claim that he was *Persian*, and his real name was *Bahubad*⁽¹³⁾. It was also reported that he had spent the years 861 and 862 in *Samarra* where he kept contacts with some of *al- Khalifah al- Muntasir* subordinates such as *Ghanim al- Shater*, *Said al- Sagher* and *Yusir al- Khadem* probably doing menial jobs and suffering from poverty, but in 863 he left to *Bahrain* where he stayed until 868. During his stay in *Samarra*, he had observed the luxury and profligacy, which the *Khalifah* and his retinue and the people of

influence were living in. He detested this condition so much that he decided to come down to *Basrah* in good time and cultivate the indignation of the *Zanj* over their conditions and raise them against the State, where he found fertile grounds for this.

Making advantage of the conflict between two *Turk* army factions in 868 in *Basrah*, he declared his revolt after he had collected around himself a good number of *Zanj*. These were dissatisfied and unhappy about their conditions and towards whom he had shown sympathy. The revolt started by carrying out raids on *Basrah*, *Wasit*, *Ahwaz* and the areas around them, which caused the paralysis of agriculture in these areas and the disruption of trade. In the years, 868 till 869 the *Zanj* managed to occupy large towns like *Basrah*, *Uballa* and *Abadan*. They controlled the estuary of the Tigris, which meant cutting off the *lower al- Sawad* from the other parts of *al- Sawad* and resulted in great losses to commerce, and their control of vast agricultural lands affected the food supply even to Baghdad. The defensive warfare tactics used by the *Zanj* included breaching the canals and flooding large tracts of land to obstruct the advance of the *Abbasid* troops which were sent to fight them; moreover, excavating long trenches and clearing large tracts of palm trees orchards were also practiced in this fight. The raids on prosperous villages caused the destruction of a great number of them while the villagers either were killed or fled abandoning their cultivated lands and orchards. In this long fight, the forces of *Zanj* advanced as far as *Nu'maniya* north of *Wasit*, and *Jarjaraiyeh*, which was located only 70 miles south of

Baghdad and had caused extensive damages to irrigation networks in the whole region. In the counter offensives of the *Abbasids* armies led by *al- Muwaffaq*, *al- Mu'tamid* brother, they had to remove the dams and obstructions that were constructed by the *Zang* for stopping navigation on the Tigris and the other rivers and canals in the war theater.

The *Zanj* uprising brought heavy losses to the landowners as well as the slave's owners. The wealth of those property owners depended on using large numbers of slaves in agriculture and in ameliorating the lands by removing the salts from them almost at no cost. Loosing this workforce meant loosing very cheap production tool and exposing their large agricultural estates to ruin. Thus, the war between the *Zanj* and those landlords, which continued unabated for fourteen years, was characterized by hatred and violence.

The continuation of the *Zanj* conflict throughout this period had very grave consequences on the economy of the *Abbasid* State and ruined the area especially in *Lower Sawad* region. The raids of the *Zanj* on *Basrah*, *Wasit*, *Ahwaz* and neighboring areas naturally led to the paralysis of agriculture and the disruption of trade in these parts. Similarly, their occupation between 255 and 256 of large cities such as *Ubulla* and *Abadan* and levying taxes on the population, in addition to imposing their authority on the estuary of the Tigris, led to very negative results on Baghdad itself, whereby confiscating the agricultural lands and crops of the *Lower Sawad* had deprived Baghdad from a very important source of food. The disruption of the

communication lines reflected very badly on its trade and the transport of the crops. It was that, whenever the *Abbasid* army restored these lines, they were cutoff again by the repeated attacks of the *Zanj*, and it was reported that even the navigation in Shatt al Arab stopped completely for ten years between 255 and 265. Having in mind that *Basrah* was the only port of Iraq on which the imports and exports of the *Abbasids* depended upon, then one can imagine the large losses the *Abbasids* suffered due to this conflict ⁽¹⁰⁾.

It may be concluded that the damage caused by this war on the irrigation networks of the *Lower Sawad* and therefore, on agriculture was very extensive. This may lead to the belief that it may have taken a very long time to restore the condition even partially to its original state, especially with the weak economic situation of the *Khalifah* and the lack of funds.

The extent of damage which this conflict caused may be better understood by going back to the estimates of human casualties suffered during this bloody war. One historian had put them at one and a half million casualties⁽¹⁴⁾, while another source estimated them at two millions and a half ⁽¹⁵⁾.

The *Zanj* uprising affected the economy very badly on account of the large amounts of money that were spent on it, which strained the treasury in addition to the damages caused to large cities like *Basrah*, *Uballa*, *Abbadan*, *Wasit* and *Nu'maniya* which suffered destruction as they were looted and burnt down^{(15),(16)}. Similarly great number of villages met the same fate and large areas of very fertile lands went

out of cultivation resulting in the rise of food prices in an unprecedented way. As an example; the price of one *kur* of wheat reached 850 dinars in Baghdad and Hejaz⁽¹⁷⁾. The total cost of war to the treasury in the year 869 only, amounted to 900000 dinars, and the financial problem was so big that *al- Muwaffaq*, the strong man behind *Khalifah al- Mu'tamid* (870- 892), had thought seriously of levying additional taxes on the merchants. The deficit was so large that all attempts failed to restore conditions to the previous conditions, especially with the increasing unrest that continued to face the government.

In the aftermath of this war, the *Khalifah al- Mu'tamid* appealed to the farmers to go back to their farms. He tried to encourage them by giving cash advances to rebuild their villages and farms and even supplied them with seeds and animals⁽¹⁸⁾. The total amount of money which was handed down to farmers, was, however, very little, and it did not exceed 36000 dinars due to the empty treasury.

The *Zanj* conflict, in addition to what it had caused of negative impacts on the *Abbasid Khilafa*, by the devastation of the irrigation works and agriculture and the economy as a whole, it had far reaching results on diminishing the prestige of the *Khalifah* and revealed its political and military weaknesses.

The next *Khalifah al- Mu'tadid* (892- 902), however seemed to be more firm than his predecessors and was able to return the seat of *Khilafa* from *Samarra* to Baghdad to avoid the influence and the pressure of the *Turks*. He managed also to revive temporarily the

strength of the State and was successful in repelling the *Byzantines* and restoring many cities in Syria from their hands, which they had captured previously. He also drove the *Kurds* out of Mesopotamia, but his main achievement was returning back peacefully Egypt under the tent of *al- Khilafa*, and his relation with *Khumarweih*, the successor to *Ahmad ibn Tulun* was strengthened by his marriage to “*Qatr al Nada*” the daughter of *Khumarweih*⁽¹⁹⁾.

This revival period was short lived after which the *Khilafa* plunged again into turbulence due to the fighting with *al- Qarmatians*. The *Qarmathians* movement had its beginning in the general *Ism'ailiyya* movement as a covert religious organization. The *Ism'ailiyya* itself was first established in Syria and was soon to spread to *Ahwaz*, *Bahrain* and the eastern part of *Arabia*. Its main belief was of the inevitable appearance of *al- Mahdi* from the descendents of the Prophet Mohammad through his daughter Fatima; *al- Mahdi*, he who would become the *Khalifah* of all Muslims and would fill the earth with justice and satisfy the poor and the needy.

In 899, *Hamdan Qarmat* the chief *Ism'ili* missionary (*da'iyah*) in *Lower Sawad* split off from the main movement and formed the new brand of this religious sect, which was called after him. *Qarmat* preaching was received well by the multitude of people, especially the poor who were dissatisfied of the large difference in wealth between the rich and the poor. However, not very much is known about *Hamdan Qarmat* except that he lived for some time in a village in the *tusuj* of *Badaqla*, east of *Kufah*. Then, he moved to *Kufah* itself

and made of the city the center of his covert movement. The movement gained much of its momentum taking the opportunity of the confusion created in the wake of the *Zanj* rebellion. For several years in the aftermath of the suppression of *Zanj* revolt in 883, the *Abbasids* authority was not firmly re-established in the *Lower Sawad*. Only in 891/892 that reports from *Kufah* on this "new religion" and the news on the mounting *Qarmatians* activity began to cause concern in Baghdad. However, no action was taken against them at the time.

Qarmat and his theologian brother-in-law 'Abdān prepared southern Iraq for the coming of the *Mahdi* by creating military and religious stronghold. Other such strongholds grew up in 899 in Yemen, eastern Arabia (Arabic *Bahrayn*) and North Africa . The *Qarmatians* attracted many new followers due to their zealous activities and messianic teachings, and *Qarmat* grew more in popularity by levying taxes on the rich and affluent people and distributing part of it to the masses of the poor⁽²⁰⁾. The movement did not go into open revolt until 899 when its leader at that time was the successor of *Hamdan Qarmat*; who was *Abu Said ibn al- Hassan ibn Bahram al- Jannabi*; a *Persian* from a village called *Jannaba* in *Persia*.

The first violent clash with the *Abbasids* occurred in 902 during the last years of *Khalifah al- Mu'tadid* who had sent an army to suppress the movement which was met by the *da'iyah Zakarwayh ibn Mihrawayh*. Historians differ on the outcome of the fight; while some of them reported the *Qarmatians* defeat and that *Zakarwayh* was

captured and killed ⁽²¹⁾, another source claimed that the *Qarmatians* had defeated the *Abbasids* army, captured its commander and occupied *al-Bahrain*, *Yamama* and *Oman*⁽²²⁾.

The *Qarmatians* movement continued its challenge to the *Abbasid Khilafa* under *Abu Said al-Jannabi* while it was firmly established in Bahrain, where they managed to have their State. Their threats and violence grew up considerably during the time of *Abu Tahir Sulayman* (906–944), *Abu Said's* son, and they were then so emboldened that they raided *Basrah* in 923, where they managed to enter the city, plunder it, and shed the blood of its people. *Kufah* had the same fate in 927 when they repeated what they had done in *Basrah* defeating an *Abbasid* army in the process and advancing towards Baghdad threatening the *Abbasid* capital in 928 and pillaging much of Iraq's *Sawad* when they could not gain entry to the city.

In 930, *Abu Tahir* led the *Qarmatians'* most notorious attack when he pillaged *Medina* and *Mecca*. Being unable to gain entry to the city initially, *Abu Tahir* called upon the right of all Muslims to enter the city and gave his oath that he came in peace. Once inside the city walls the *Qarmatian* army set about massacring the pilgrims, taunting them with verses of the Quran as they did so. The bodies of the pilgrims were left to rot in the streets or thrown down the *Well of Zamzam*.

The *Ka'ba* was looted, with *Abū Tāhir* taking personal possession of the Black Stone bringing it back to *al-Hasa* and holding it to ransom. Later on, they forced the *Abbasids* to pay a large amount of

money for its return in 951⁽²³⁾, and the *Abbasid Khalifah* was obliged to pay them yearly tribute of 120,000 dinar per year for the safe passage of the pilgrims to *Mecca* in addition to charging them certain fees.

In 945, the Khilafa in Baghdad had entered a new phase of its history as it was subjugated under the control of the *Buwayhids* dynasty. This encouraged the *Qarmatians* of Bahrain to make their next move, and sought to assert their hold over southern Iraq. In 983, they attacked *Basrah* and had to be bought off by a tribute. In 985, a *Qarmatian* army repeated their attack but now on *Kufah*. As the *Buwayhids* government tried to reach a peaceful settlement, they began to confiscate crops and valuables from the farmers, hence the government was forced to act, and so it inflicted two humiliating defeats on the *Qarmatians* who were forced to withdraw and were permanently deprived of their influence in Iraq. Finally, in 988, *al-Asfar* chief of *Banu el-Muntafic* of 'Uaqyal Arab tribe defeated the *Qarmatians* and laid siege on *al-Ahsa* and pillaged *al-Caitiff* carrying off the booty to *Basrah*. The *Qarmatians* lost their privilege of escorting and taxing the pilgrim's caravans, claimed now by *al-Asfar* and other tribal chiefs, and were reduced to purely local, self-contained power.

Little is known about their late history but outside Bahrain, the *Qarmatians* communities were rapidly absorbed into *Fatimid Ismailism* or disintegrated⁽²⁴⁾.

In more than one hundred years, this movement and the previous *Zanj* uprising had caused great damage to the *Abbasid Khilafa* lands, especially to *al-Sawad*, and left the *Khalifahs* in a very weak and shaky position for loosing so much revenue in addition to bearing the high costs of the wars. One recent study has summarized few examples of the costs of the *Qarmatians* war during the *Khilafa* of both *al- Muktafi* and *al Muqtadir*, which were based on the writings of Muslim scholars. These examples are given here for indication only, and they cannot be taken as a complete list of all the costs and damages that were sustained by the treasury during the reign of these two *Khalifahs*:

- ✓ The *Khalifah al- Muktafi* spent 100,000 Dinars in 902 only in this war.
- ✓ In 905, the *Qarmatians* advanced towards Hit from their stronghold in Syria and looted the ships navigating the Euphrates.
- ✓ In 906, they attacked and looted the pilgrim's caravans causing 2,000,000 dinars of losses.
- ✓ In 914, during the reign of the next *Khalifah al Muqtadir* he spent 1,000,000 dinars in defending *Kufah*, and then 1,500,000 Dinar more in other locations in his war.
- ✓ In 915, the *Qarmatians* ambushed the agents of the treasury and confiscated the tax collections from *Ahwaz* and *Basrah*, which amounted to 300,000 dinars.

- ✓ In 924, the same *Khalifah* spent 1,000,000 dinars in defending *Kufah* again, and then 1,500,000 dinar more in other places in his war.
- ✓ In 925, the *Qarmatians* attacked pilgrims' caravans again with unaccounted magnitude of losses.
- ✓ In 926, the total amount spent to protect Baghdad against the *Qarmatians* attacks came to 3,000,000 dinars, while they had looted 1000 *kur* of barley and 100 *kur* of wheat.
- ✓ In 927, the total amount spent by the *Khalifah al- Muqtadir* in the war against *Qarmatians* in *Kufah* and *Wasit* reached 1,870,000 dinars
- ✓ In 928, the *Qarmatians* attacked *Kufah* once more coming this time from *Ein al- Tamer*, confiscated the *Kharaj* money, and took it upon themselves to do the administration after they had dismissed the agents and officials of the *Khalifah*. In the same year, they attacked *ahl- Rahba* and *Deyar- Raby'a* in the *Khabour* districts of the *Jazira* region and looted five thousand camels and large number of cattle.
- ✓ In 931, the *Qarmatians* raided again *Kufah* and looted the depots of the crop belonging to the *Khalifah* and others.

The same study concluded that the *Qarmatians* war had resulted in grave financial crises and led to soaring food prices and even to widespread cases of famine⁽²⁵⁾.

Other studies included lengthy descriptions on how these frequent wars reflected badly on the conditions of the irrigation systems and agriculture in the Iraq's *al-Sawad* leading to their deterioration and decline.

They explain that although the Arabs had inherited some very rich territories after the conquest of Iraq and *Persia* and elsewhere, Iraq's *al-Sawad* was the keystone of their empire and its prosperity. Mesopotamian agriculture was so productive that the support of farming population only required about 36% of the net output of food produced. The rest was available to support great cities, extensive commerce, and vibrant culture. This prosperity had corroborated the Golden Age of Islam. Nevertheless, this success required irrigation, and the geography of the *al-Sawad* meant that state support was vital. Unlike in *Persia* where irrigation with *qanāt* (*Karez*) was done on small scale and could be organized locally by private entrepreneurs, the Mesopotamia plain required giant long canals to realize the full potential, and these canals required public investment for their construction and maintenance. When the *Khalifahs* were rich and farsighted, the system worked, but when money became short and other immediate needs dominated; maintenance of the canal system was threatened. In the *Abbasids* case, the actual total income to the *Khilafa* treasury had decreased from 422.3 million dirhams in 780 just after the death of *al-Mansur* and during the reign of his son *al-Mahdi* to 189, 5 million dirhams in 918; out of this the share of *al-Sawad*

decreased from 90.5 million dirhams to 38.3 million dirhams in the same period^{(26),(27)}.

Clearly, the canal system in *al-Sawad* was unsustainable without large investments, which the State could not make available during difficult times. Lack of proper irrigation and drainage led inevitably to canals siltation and salinization of the soil and therefore, attempts to keep good soil conditions were doomed to failure. Moreover, after the difficult times that the *Southern al-Sawad* had gone through during the *Zanj* and *Qarmatians* upheavals, it did not enjoy the same importance as a lucrative place for investment that it had before the sacking of *Basrah* by the *Zanj* and *Qarmatians* when the *Batiha* became a bastion for the rebels. There was no longer any economic incentive to restore the cultivation of the area while large proportion of the farming population had immigrated elsewhere as their safety was threatened. Therefore, the land became a barren landscape, marked by the traces of the moments of agriculture expansion but never brought under the plough again⁽²⁸⁾.

Just to emphasize this point, evidence from archaeological records has shown that previous intensive agricultural activity had left significant traces in the landscape. In the early 1960s, these findings detected very distinctive landscape to the south and west of *Basrah*. The irrigation systems had occupied previously an enormous area of 57,000 hectares lying between the old westerly course of the Euphrates and *Shatt al- Arab*, but in 1962, just eight thousands of

these hectares were used for cultivation of date palms along *Shatt al-Arab*: the rest reverted back to desert⁽²⁹⁾.

Another example of the inability of the late *Abbasids* to sustain the old irrigation projects they had inherited from the previous times is the collapse of the *old Diyala Dam* which may be cited here. In the year, 912 during the reign of *Khalifah al-Muqtadir*; this serious event occurred, and it had far-reaching consequences on the *Nahrrawn Canal System* and the cultivated land it had served. The dam and its role as a key structure in this system were described fully in chapter (9) and need not be repeated here, but the gravity of its collapse cannot be overlooked. The collapse which was due to negligence led to cutting off the water supply from its source from the Tigris through the (*Katul Kisrawi*) and depriving the *Lower Nahrawan* canal and all its distributaries of water that was irrigating the fertile lands extending down to Kut.

An attempt was made in 932 to divert some water to the *Lower Nahrrawn* canal directly from the Diyala River by building a temporary dam called *Masn'at al Suhyla* which could not replace the old Diyala Dam completely. But even this dam collapsed later on more than once due again to negligence, and according to the writing of *Yaqut al-Hamawi* the dam collapsed for the final time in 1228 and all the cultivated lands below Diyala River down to Kut were deprived completely of their water supply and turned to semi desert land covered with windblown sands. This event drove the population to migrate elsewhere. Consequently, all settlements and towns in this

area fell to ruins. The history of this period as written by Muslim scholars like *al- Qiqzwini*, *Yaqut*, *Ibn al Jawzi* and others agreed that many of the irrigation systems in *al- Sawad* suffered destruction due to either conflicts between rival warlords, negligence and lack of maintenance or both (30).

The bitter rivalry between the various *wazirs* and army commanders had also reflected badly on the canal network of the *Upper Nahrawn* canal, which irrigated the domains around Baghdad. Many such events occurred between 935 and 945, which led to intentional destruction of the canal's banks to flood the land and obstruct the enemy advance. Moreover, these actions resulted in extensive loss of crops and left the cultivated lands without water supply for long periods, and therefore, stressed the lives of the people by raising the prices of food. One particular important case was witnessed in 941 during the fighting between *Ibn Raik* and the other *Turk* leader *Bujukum* that led the former to breach the *Nahrawn* canal to prevent *Bujukum* from advancing towards Baghdad.

Negligence and lack of maintenance during this period of confusion caused the breaching of canals around Baghdad. In 940, for example, both the *Rufayl* and *Buk* canals breached due to negligence, and resulted in the ruin of the *Baduraya* district lands for more than ten years and kept them out of cultivation for this whole period. Before that in 934, *Nahr Isa*, which supplied water from the Euphrates to the quarters of Baghdad (west), had breached and could not be repaired. No repair works to damaged canals were performed

except what was done in 938 by the *Khalifah* in repairing the *Sarat* canal, which had irrigated the lands around western Baghdad. *Khalis* canal which bifurcated from the *Nahrawn* canal and irrigated most of the area around eastern Baghdad was left without repair for many years after it had breached in the year 945⁽³¹⁾.

The welfare of the people of *al-Sawad* had always depended so much on the irrigation systems and the cultivation of the land, and the disruption of the water supply had resulted in grave consequences, and in many instances had caused severe famines. An example of such famines was reported in *Miskawayh*'s book "*Tajarib al- Umam*" (Experiences of Nations). *Miskawayh* who had lived in (932- 1030) and was contemporary to these events described the aftermath of the collapse of the *Old Diyala Dam* during the fight between *Muhammad ibn Raik* and *Bujkum*, which was mentioned already. He reported that the following years were years of hardship, which had culminated into wide spread famine. He said:

"In 964 people had no bread at all and were forced to eat the dead, the grass and the decomposed corpses. They collected and searched the dung of mules and other animals looking for barley corns to pick out and eat. The cotton seeds were taken and wetted with water before they were put on a hot iron plate to dry out to be eaten; a thing which caused them to have tumors in the intestines and so they either suffered death or were very close to death. Men and women and children would stand on the roadway pleading and shouting, hunger, hunger until they drop

dead. If anyone found a small piece of bread he would hide it under his cloth for fear it would be snatched from him. The large number of the dead made it impossible to bury them all in good time and the dogs would devour their flesh. Large numbers of the poor left to Basrah to feed on dates but the majority of them perished on the road; those who arrived died shortly afterwards. A Hashemite woman who had stolen a child was caught eating him after she had baked him alive in an oven and so she was beheaded. Houses and estates were sold for some loaves of bread and the broker took some of the loaves for his service. Another woman was found killing children and eating them and when this was discovered she had already killed many of them. When the fitna (conflict) was over the new crops arrived and the prices went down”⁽³²⁾.

The years from 908 until 944 were also especially difficult on the people whereby the *Abbasid Khilafa* had passed into a very difficult time during which four *Khalifahs* had ruled namely *al- Muqtadir*, *al Qahir*, *al- Radi.*, and *al- Muttaqi*. This period was characterized by increasing influence of the *Turk* military leaders and the meddling of the palace harem and court officials into the government affairs, which was undoubtedly accompanied by decreasing authority of the civil establishment represented by the *Wazir*, and the *Scribes* who managed the various government departments or “*Diwans*”. These conditions aggravated the situation of the State and its civil management leading to a bankrupt treasury, mutinies of the soldiers

over the delayed payment of their stipends and more conflicts, wars and bloodshed.

In the prevailing chaos, new armed powers began to appear on the outskirts of the *Abbasid Khilafa* challenging the *Khalifah* and the *Turks* authority in Baghdad. Of these were the *Hamdanid* dynasty in *al- Jazira*, *al- Baredyuon* in *Basrah* and *Ahwaz*, and the *Buwayhids* who were from *Dailamite* origin, who had already spread their control over *Faris* under *Imad al- Dawla ibn Buwayh* in 932. More *Dailamites* had already been in the service of the *Khalifah* in Baghdad as soldiers and had formed strong lobby competing with the *Turks* and playing an important role in the affairs of the state. Their influence had grown to the extent that their leader *Touzon* was promoted to the position of *Amir al- Umar 'a (Prince of all Princes)* by the *Khalifah al-Muttaqi* (940- 944). This position was created by the previous *Khalifah al- Radi* (934- 940) combining the army high command with the *Wazir* duties of running the civil departments (*Diwans*) and the treasury all into one post. This meant, in effect, minimizing the temporal authority of the *Khilafa* by putting very large power in the hands of *Amir al- Umar'a* himself.

Regional wars with the *al- Baredyuon* separatists in *Ahwaz* and *Basrah* in the south and *Hamdanid* in the north during the same period overburdened the treasury and caused in many instances stopping the food supplies from reaching to Baghdad, which caused a sharp rise of food prices. The theater of these conflicts was the whole of *al-Sawad*, which meant more permanent destruction of the canal's

networks. These events opened the way to other developments, which marked even darker days for the *Abbasid Khilafa*, namely the occupation of Baghdad itself by the *Buwayhids* under *Ahmad ibn Buwayh* in 945 and their rule over what remained of the *Abbasid* lands until 1055⁽³³⁾.

On entering Baghdad in 945, the *Buwayhids* managed to establish their principality at the heart of the *Abbasid Khilafa* supported by their legions of *Dailamites* and *Turk* troops, and while they had stripped the *Khalifahs* completely of their temporal powers, they kept to them their religious functions only for political reasons. In taking the position of *Amir al- Umar'a*, their princes had full control of the military affairs, the treasury and the administration of the State.

During the *Buwayhids* ruling period, which lasted 110 years, eleven *Amir al- Umar'as* had ruled in Baghdad and four *Abbasid Khalifahs* were on the throne. Other members of the *Buwayhid* family ruled in *Faris* and in *Rayy*, *Isfahan* and *Hamadan*. The first *Amir al- Umar 'a* in Baghdad was *Mu'izz al-Dawla* (945–967) who in addition to having control over Baghdad, had also controlled over *Wasit*, *Basrah*, *Kufa* and *Ahwaz*. During his term *Mu'izz al-Dawla* was very busy in strengthening the *Buwayhids* rule in addition to solving a great host of military, administrative and financial acute problems. Of the first, he directed many campaigns against the threats of *Hamdanids* in Mosul, *al-Baredyuon* in *Basrah*, and the mutiny of an outlaw called *Omran ibn Shaheen* who had taken refuge with his followers in the *Batiha* and refused to pay taxes. He was even forced

to confront the *Qarmatians* in their attempts to invade *Basrah* coming from Oman.

The treasury during this time was depleted and *Mu'izz al-Dawla* realized that reform was needed to rectify the situation in order to be able to pay the delayed salaries of the troop. On the administrative level, the repair and maintenance of the irrigation systems were an urgent task after a long period of neglect and recurrent fighting. Most writers have agreed that *Mu'izz al-Dawla* had attempted his best to rectify the situation as being aware that a flourishing agriculture was the best way to solve the other financial problems. In this respect, he managed to repair some of the irrigation canals and used the army to reconstruct damaged once and maintain others. It was even said that he had carried the earth of excavation himself to give a good example to his soldiers. After twenty years of abandonment of the best cultivated parts in the *Nahravn* districts around Baghdad, a thing which had led in the 964 to the famous famine, the land was put back again into cultivation, and Baghdad became prosperous again and “fine bread being sold at twenty ratls to the dirham”. *Mu'izz al-Dawla* attempted even to repair the damaged estates of the *al-Sawad*, and he commissioned *Aba al-Faraj Abi Hisham* to do this in 945. He tried also to solve the financial problems caused by the conflict of the tax collection timing in the *Hijri* calendar and transferred this collection from the year 961 to 962⁽³⁴⁾.

The good results which came out from *Mu'izz al-Dawla*'s efforts and the outcome of his care and attention to the irrigation works

disappeared against his bad policy towards land ownership, which he was compelled to follow in trying to solve the acute problem of the troop's payments . This new policy came to be known as the *Military Iqta'*. In this policy he tried to satisfy the commanders of the troop by granting to them fiefs (*qati'as*) of land at cheap prices. *Miskawayh* in his reporting of this gave a vivid account describing this important event:

“And in this year, the Dailamites rose in mutiny against Mu'izz al-Dawla in violent riot, and indulged in fierce confrontation with him. He gave them his word to release their payment within a period he fixed. So he was forced to lean heavily on the people and extort money from improper sources, and he gave away to his commanders, his household and his Turks as qati'as (fiefs) the estates of al- Khilafa, the estates of those who had gone into hiding, such as those of ibn Sherzad, and the rights of Bait il- Mal (Treasury) or the estates of the public. The majority of al- Sawad was locked up, and it became outside of the tax collectors authority, only a little remained to be taxed and farmed. He closed down the Diwans (Government Departments), laid off their officials and all the Diwans were gathered in one”.

Miskawayh lamented the grave mistake *Mu'izz al-Dawla* had committed by this action and he went on to say:

“When the administration is based on faulty principals, even if it did not appear so at the beginning, it will show this in the long time. It is as when a man deviates from the straight road

very little and this goes by unnoticed in the beginning, but if this continues and he goes further away, the more he continues the more he diverges from the right road, and the error becomes more apparent and his conditions become much different. And so he (Mu'izz al-Dawla) gave most of the lands of the Sawad in to qati'as when these lands were out of cultivation and were not reclaimed back and their values were low; then the vizers were complaisant to the assignees, took bribes and accepted gratuities themselves, and in other cases allowed themselves to be influenced by intermediaries, so the qati'as were given at different rates. As the years passed and the land came into cultivation, in some cases, the crops flourished and its output increased, but the same had decreased in others due to fall in prices; for when these qati'as were granted to the soldiers their prices were high due to the famine which had been described. Those who made profit retained the qati'as which was in their hands, and it was not possible to make proper assessment of their due taxes. Those who lost returned their qati'as and were compensated by getting other qati'as instead to make up for their losses. This became a wide spread practice and a common procedure for the soldiers who used to ruin their qati'as and take others of their own selection in exchange. Therefore, they managed to be always the gainers and got a profit. The returned qati'as was granted to persons whose goal was only to take all what they found there, and presented an account of part. They

would not take any step to put this qati'as back into cultivation. It became a procedure for those assignees to come back and seek fresh qati'as from the returned once which had got mixed together on the basis of their present value when that value was reduced to the lowest possible figure. The original deeds rotted away with the passage of years, the old assessments became obsolete, the old canals were ruined, the sluices got out of order, the cultivators suffered and were wretched , some of them migrated to exiles, others oppressed and patient with no hope of justice, while others were contented to surrender their land to the assignees to escape their evils and satisfy them''⁽³⁵⁾.

As a direct result of this policy, whereby the agricultural estates were no more under the control of the government, the irrigation inspectors and officials were no longer needed, and so they were laid off and their accumulated experience was lost. Similarly, tax collectors had disappeared and the works of the respective *Diwan* shrunk to just estimating the price of these estates which was then divided into installments to be paid by the *qati'a'* owners, who would in most cases evade payment making use of the wide spread corruption. The end result was catastrophic on the irrigation systems and their hydraulic structures⁽³⁶⁾.

Some authors have tried to give justifications to *Mu'izz al-Dawla's* policy towards land ownership. One of them argues that the military *iqta'* system was a result of the progressive deterioration in the financial stability of the state. A second author claims that *Mu'izz*

al-Dawla paid attention to the background of the *Buwayhids* troops with their feudal semi tribal tradition in looking to the land as being theirs by right of conquest⁽³⁷⁾.

Whatever the motives were that led *Mu'izz al-Dawla* to take this decision it must be admitted that social and economic conditions had forced this decision, and the accumulation of mistakes and bad decisions previously made by the *Khalifahs* themselves had resulted in the deterioration of the central power itself which brought with it conflicts and bankruptcy.

It is believed that the military *iqta'* system introduced by *Mu'izz al-Dawla* had resulted in irreversible damage to agriculture in general and the agrarian relations in particular, and caused the deterioration of more land and forced many farmers to abandon the land and migrate somewhere else. Moreover, it undermined the management system which was established by the *Sassanids* and followed by the earlier *Abbasids* which was based on taking up the overall responsibility by a firm central power which took upon itself also the duty of investing in maintenance of the existing irrigation networks and the new required extensions.

Another factor, which had accentuated the financial crises during the late *Abbasid Khilafa*, was the excessive abuse of the tax farming system by introducing the new system that was known by (*dhaman*). This system had been introduced during the reign of the *Khalifah al-Muhtadi* (869- 870) as a quick way of collecting the (*Kharaj*) taxes which were mostly generated from the cultivated land and the crop

output. It meant the leasing of the tax collection job to powerful agents who would take it upon themselves to pay a fixed amount of money to the treasury (*Bait el-Mal*) against granting them the right to collect these taxes directly from the landowners and cultivators within the domain of their authority. This had caused in the majority of cases the extortion of the farmers to pay more than what was fair by using threats or even causing harm in order to make large profits. This practice had resulted in many cases into the abandonment of fertile lands when the farmers were unable to pay and were declared in default by those agents. Sometimes when conditions allowed, small landowners would put themselves under the protection of more powerful property owners against certain payment, this had led to another form of agrarian relationship, which was known by (*ilja'*) which literally means compulsion to seek protection. Although (*ilja'*) had been practised since the days of the *Umayyads* dynasty, the need for it extremely increased during the *Buwayhids* time due to the abuse of the tax collection system. Corruption, which was the common practice under the *Buwayhids* rule, made it normal to pay bribes to the government estimators responsible for leasing the tax collection jobs at exceptionally low values, which results in considerable loss of revenue to the treasury.

In many cases when tax farming had been granted to a governor of a region or (*willayat*), it happened that he would not return to the treasury the full revenue and declare only part of it; this had led to

many cases to arguments with the central government ending in disobedience and revolt in other cases^{(38),(39), (40)}.

During the *Buwayhids* period, the *Abbasid Khlipha* experienced very bad times as the *Buwayhid* Umara did not contribute much to the welfare of the people, nor could they do much to stop or reverse the trend of decline that was progressing. In fact, they had committed their biggest mistake of tearing apart the land ownership system, which had been established for many centuries and proved its success since the *Sassanid* time.

Conflicts and wars during the *Buwayhid* period undermined the central power needed for the proper management of agriculture, and for the good upkeep of the irrigation canal systems. Finally, when the *Buwayhid* strength was drained, they were expelled under a new rising power in the area, which was the *Seljuks*, who had established themselves in the neighboring regions of *Persia*.

In 1055, the *Seljuks* under *Tughrul* invaded Iraq and entered Baghdad and ousted the last of the *Buwayhid* rulers; *Al- Malik al- Raheem*. It was in fact, the *Khalifah al- Qaim* (1031- 1075) himself who had sent message to *Tughrul* asking his help to overthrow the *Buwayhids* and relieve him from the *Buwayhid* oppression and harshness.

The *Seljuks* governed Iraq as part of the larger *Seljuk* Empire whereby a *Seljuk* family branch ruled in Baghdad under *Malik Shah II* (1105) and his successors and the *Seljuk* dynasty continued to rule Iraq and parts of *Persia* until 1194. During this year, *Khwarazm*

ruler *Ala ad-Din Tekish* defeated their last *Sultan Tughrul III*, as he conquered parts of *Khurasan* and *Persia* as well and so the *Seljuk* period ended then.

The *Seljuks* proved during this period to be not much different from the *Buwayhids*. Their *Sultans'* tyranny was the same as that of the *Buwayhids* *amir al- Umar 'as'*, and their attitude towards the *Khalifahs* was almost the same. The *Seljuk Sultans* kept the real power in their hands making the *Khalifah* a titular head of state only. Moreover, they interfered in, and ran all, the *Khilafa's* affairs without the *Khalifah's* consent or will. The *Seljuks era* was inflicted with troubles and conflicts as that of the *Buwayhids*, and the *Seljuks Sultans* were busy in their bickering and disputes, or fighting with outside neighboring enemies. Even the bands of vagabonds and bandits who called themselves "*al-ayyroun*" that terrified the population of Baghdad and disturbed peace during the previous era did the same thing now. The condition of the economy was as bad as it was before, and the people complained much over the recurrent crises of extremely high food prices during these times. Worst of all the *Seljuk Sultans* surpassed the *Buwayhids* in practicing the *Iqta'* of the cultivated land by distributing *qatia's* not only to the military leaders as the *Buwayhids* did but they extended this to all their family members, their courtiers and close friends, and they did this on much larger scale⁽⁴¹⁾.

In this period, there were some attempts to reform the administration of the state and rectify the policies related to the

management of the agricultural lands. It was understood that the only way to improve the economy and enhance the power of the state was to adopt a new approach towards land ownership. *Nizam al- Mulk*, the *Grand Wazir* of both *Sultan Alp Arslan* and his son *Malik Shah* took it upon himself then to adopt a policy of reform, which was focused on land ownership and its exploitation. His first step was to distribute all the cultivable lands on the troops in a way different to what the *Buwayhids* had done and under different rules. The *Buwayhids Iqta'* meant in its initial form the ownership of the *qati'a*, itself by the beneficiaries while in the new system, at least as *Nizam al- Mulk* had seen it, envisaged that the beneficiaries had rights to the output of the land but not the land itself. At the same time, those beneficiaries were to answer to the *Wazir* himself for any misuse, which could bring the penalty of losing his rights in it^{(42), (43)}.

The *Iqta'* system during both the *Buwayhids* and *Seljuks* times was based on the *Persian* tradition of land ownership, which was followed by the *Sassanids*. The *Shah* or *King*, being the highest authority, considered that he was responsible for distributing the lands on the various clans in a just and equitable way to be used as grazing or cultivation lands, but the ownership of the land rests in the end with the *King or Shah*. The *Buwayhids* and *Seljuks*, having both the same *Persian* tribal background followed this principle at least in the beginning only, and they diverted from it later on as they followed different rules in the application.

The *Seljuk Sultans* granted all the land to their *Seljuk* soldiers, their relatives and friends who were only *Seljuks*. According to *Nizam al- Mulk*, as stated clearly in his book of rules called (*Siyasat Nama*), stipulated very clearly that the beneficiaries of *iqta'* were to cultivate their *qatia's* under the authorization of the *Sultan* and pay the *Kharaj* tax, and to be kind and generous to the farmers who worked for them. To comprehend the scale of this *iqta'*, the number of soldiers only who benefited from this system at the time of *Malik Shah* was fourty six thousand equestrians. Many more high-ranking *Seljuk* persons were also entitled to *qatia's* under the same rules⁽⁴⁴⁾. With the passage of time, the basic principles of this system were violated, and in spite of the strict rules *Nizam al- Mulk* had put down, most of the beneficiaries succeeded in keeping the land as their own, used all sorts of abuses towards their farmers and even passed the land in inheritance to their children. Some others encroached on neighboring *qati'as*, which belonged to others, and injustice and corruption became widespread⁽⁴⁵⁾.

According to the *Seljuks'* rules, the running of the whole affairs of the *qatia's* was the responsibility of the *Wazir*. Among these, he was responsible for the inspection of the *qatia's* and the observation of the rules applied to the beneficiaries, but in most of the cases the *Wazirs* overlooked the excesses and ignored the greed of those beneficiaries for personal reasons; either in exchange of favors or due to corruption. Normally, the *Wazir* should get one tenth of the revenue of the treasury which originates from *Iqta'* as salary, so in

most of the cases, they did not object the violations of the owners and their harsh treatment of the peasantry, so long as they keep their high income coming. This form of corruption resulted in general discontent and protest of the farmers, which had its impacts in weakening of the *Seljuk* society and led to the deterioration of the agrarian relations and agriculture as a whole.

Apart from the attempt made by *Nizam al- Mulk* to reform the land ownership system, which did not bring good fruits, very little is known of any construction works or projects that could have served irrigation and agriculture. One general statement which was made by the Muslim scholar and historian *ibn Khillikan* (1211- 1282) in the praise of *Sultan Malik Shah ibn Alb Arslan* indicated that some of the works were done by this *Sultan* without giving much details; where he states:

“He exerted himself to spread the benefit of civilization; he dug numerous canals, walled a great number of cities, built bridges, and constructed ribats (military outposts) in the desert”⁽⁴⁶⁾.

As a matter of fact, we have a gap in our knowledge of any of the works that *ibn Khillikan* had attributed to *Sultan Malik Shah*, or whether there had been any other significant irrigation works that were ordered and overseen by the other *Sultans*, especially that in this form of *Iqta'* such works were assumed to be done by the beneficiaries who had ignored. We should realize however, that large scale works could not be performed without the support of the central

government as the case had always been in the irrigation works of the *Sawad* since the *Sumerian* time.

Generally speaking the *Seljuks'* military *Iqta'* caused the retrogression of agriculture and the decay of the irrigation systems of the *al-Sawad* lands. The lack of knowledge of the agricultural practices on the part of the *qati'as* owners and their dependence on their local agents in managing their vast estates led to mismanagement. The agents themselves did not have full control of the expenditures or revenues, and they were ignorant of the best methods or ways of doing the work. Being tough barbarians, they saved no effort in oppressing the farmers and deprived them of their rightful shares, and they often had attacked neighboring nonmilitary estates and confiscated their crops. This led to the abandonment of the farmers of large tracts of farmlands and their migration to safer places leaving the land to rot ⁽⁴⁷⁾.

The *Abbasids* economy was basically an agrarian one in which the welfare of the people depended on the availability of food commodities in the markets at fair and reasonable prices. At times of disturbances and conflicts, the impacts on agriculture were profound and the supplies to the markets diminished, but often this was the case during the *Seljuk's* period when the major property owners who had to pay very high taxes to the *Sultans* monopolized these supplies. Many economic crises in the *Seljuk's* period had occurred in which they left their marks on agriculture, and the *qati'as* owners put the farmers themselves under pressure. Examples of such crises were

recorded in 1055 when the general situation became tumultuous at the *Seljuk* troop entry to the country and the subsequent plundering and looting of the towns, villages and their granaries. The prices of bread and meat doubled, and the people were very much stressed. The same thing was repeated in 1056 when the crops were damaged and there was a shortage of them. The *Seljuk* soldiers caused another period of soaring prices in Tikrit following the looting of crops stores and granaries.

Conflicts and fighting between the *Seljuk Sultans* themselves brought about very bad and unbearable conditions. In 1099, one such conflict broke out between *Sultan Barkiyaruq* and *Sultan Muhammad ibn Malik Shah*. Consequently, large tracts in *al- Sawad* were damaged and their crops destroyed which reflected badly on the markets and drove the exploiters of the merchants to take advantage by using all unlawful means to raise the prices. The one *kur* of wheat was sold for ninety dinars, and many of the poor starved to death. In 1102, the villages and agricultural estates in the *Dujail* district were looted leading to a sharp rise of the bread price, and each three *ratls* of bread were sold for one *karat* when their previous cost was ten *ratls* for the *karat* (48).

Similarly; during the period 1112- 1179, prices went up to unprecedented levels as a result of the decrease in the cultivated land area in direct consequence to the prolonged impacts of the *Seljuk Iqta'* system whereby the farmers had left, and large areas were deserted. With no working hands to do the job, the prices of land hit a bottom

level, and some of the plots were sold for mere five *ratls* of bread. Just to see what the *Seljuk* period had done to on the cost of living, the price of one *kur* of wheat was twenty dinars when the *Seljuks* entered Iraq, but this price reached ninety dinars after only few months, and continued to increase to reach double this price after a while. Even the bran of wheat was sold for seven to ten dinars ⁽⁴⁹⁾. In one particular case during the reign of *Sultan Mahmoud* in 1135, an extreme and general scarcity of food swept the country due to negligence of the irrigation works and the people in Baghdad and the whole country rose in protest, and the mob pillaged and sacked the cities and towns⁽⁴⁹⁾.

The fighting and frequent conflicts erupting between the *Seljuk Sultans* themselves contributed heavily to the destruction of important irrigation canals and their ancillary structure with no hope of any reconstruction or repair. Such networks were not maintained or brought up to a satisfactory level of service as the *Iqta'* beneficiaries were not interested in spending on these repairs, and their only concern was collecting more money to pay the taxes levied on them by the central government in lieu of their *qatia's* exploitation. Central governments in its turn did not care for performing such maintenance or repairs as the treasury was always depleted due to the high spending on wars and fighting and the decline of the revenue of the treasury.

The whole land of *al-Sawad* suffered those excesses, and the general picture was bleak and told of a near total collapse. The

decline in the agricultural yield in almost all *qati'as* reduced the income of the property owners. It caused them to put heavy burdens on the peasants working in their *qati'as*, demanding more payments and even forced labour, when the peasants were unable to go along with these demands. They sent their *Seljuk* armed bands to plunder and destroy the villages and kill the inhabitants. Muslim scholars such as *Yaqut*, *al- Qiqzwini*, *Ibn al- Ather*, *al -Edrissi*, *Ibn al- Jawzi*, and many others recorded in their writings many examples of such acts.

Of these some examples were cited of the looting and ravaging of prosperous towns and villages. Areas affected were, *Akbara*, east of the Tigris, *Sura* on the Euphrates, *Wasit* and its southern district *Bahmnardashir* on the lower Tigris, *Al Dujail* district and its numerous villages, one of which was *Awana*, all north of Baghdad, the town of *Bajisri* on the *Nahrrawn* canal, the prosperous villages west of *Tikrit*, the village of *Banarik* located between *Baghdad* and *Nu'maniya*, the district of *al- Dahiriya* and many more.

In effect, this systematic destructive work covered the whole area of *al- Sawad*, which was previously fertile and abundant in crops and was covered with cultivations and lush fruits trees and date palm orchards, and where the villages were very rich and raised large herds of cattle, sheep and other animals. The devastating works covered large cultivable areas and caused the disappearance completely of many populated districts such as *Jokha*, the most flourishing and large district of Baghdad countryside, and the *Daskara* of *al -Dahiriya* close to Baghdad. Such destruction extended to numerous canals and

waterwheels that were in use in many of these districts. An example of these is the two waterwheels in the villages of *Beshine* and *Zurfafiya*, which were a large village in the *Quwsan* area, in addition to two hundreds and seventy more waterwheels that were serving agriculture in the region west of Baghdad⁽⁵⁰⁾.

Fighting, which had erupted so frequently between the *Seljuk* troops in the struggle between the *Sultans* themselves over power such as that between *Sultan Mahmoud 1* and his brother *Barkiyaruq* contributed to the destruction of irrigation canal systems, especially those connected to the *Nahravn Grand Canal*. This was because of the troop's use of the banks of these canals, especially the *Katuls* of the *Nahravn*, as roadways in the marching and counter marching that accompanied court intrigues in Baghdad. Both the possibilities and incentives for continued settled life in the areas alongside these canals gradually disappeared altogether, in addition to the enormous damage inflicted on the canals themselves. The gross neglect of the irrigation systems and the indifference to maintenance requirement was characteristic of the period of the *Seljuks*; and the damages caused by their own troops were left without repair.

The unrepaired breach of the *Nahravn* canal near *Nahravn* town led to general abandonment of the land around the middle of the tenth century. This serves as one example in a wide range of deterioration that beset not only the administration in Baghdad but the whole rural economy as well⁽⁵¹⁾.

Finally, the case of the *Tughrul* advance towards Baghdad with his troops of fifty thousand men in 1055 gives us one more example of the destructive and irresponsible behavior of the *Seljuks* in using the *Nahrawn* canal banks along the *Khurasan* road as their way⁽⁵²⁾,
(53).

In this chaotic period one more case serves to illustrate the disordered condition which left far reaching results on the future of agriculture; this is the collapse of the *Old Adhaim Dam* in 1150. This key structure was of extreme importance to the *Upper Nahrawn* system, in the same way as the *Old Diyala Dam* was essential for the *lower Nahrawan system*, whereby its failure meant the devastation of the whole agriculture of the *al-Sawad* east of the Tigris River down to the *Diyala River*. The role and details of this important structure were fully covered in chapter (9) and the reader can refer to that. Examination of the ruins of this majestic masonry dam indicated that it was cracked and left with no repair or decent maintenance for a very long time. One author even adds one more reason to this by attributing the failure to intentional acts of war during the *Seljuk* period in the fighting between their Sultans ⁽⁵⁴⁾.

This event resulted in drying up all the distributaries of the *Upper Nahrawn* and cutting off the water supply to the lands in the *Tusuj* around Baghdad. The agricultural landscape of these districts changed drastically, and they turned to barren lands. Of the major tributaries, which were hit by this event, were *Nahr Buk* and *Nahr Ben* which carried water from the *Nahrawn* to east Baghdad. The intake of the

other major canal *Nahr al- Khalis* had to be shifted to a new intake on the *Diyala River* close to the site of the *Old Diyala Dam*⁽⁵⁵⁾ where it remained until the construction of the new *Diyala Weir* in the 1960s.

In similar ways, all of *al- Sawad* irrigation systems between the Tigris and Euphrates Rivers suffered neglect and abuse during the *Seljuk* period in contrast to the keen attention and intense care exercised by the *Sassanids* and early *Abbasids*. The fine and diligent management that was exercised by the strong central governments of those times was absent during the *Seljuk* period. Their management of land by the application of their military *Iqta'* released the central government from its obligations for maintaining the irrigation systems and left these functions to be done by the landlords who were ignorant of any knowledge related to the agrarian operations and oblivious to the necessary maintenance. The communal efforts normally required for flood protection, or reconstruction efforts in the aftermath of destructive floods were missing on the part of both the government and the property owners. Five major floods of the Tigris and Euphrates in 1075, 1108, 1122, 1172, and 1173 left their permanent marks in the whole of *al-Sawad* towns and fertile lands.

Breaching of major canals because of negligence was more than often. The numerous towns and village, which spread all over *al-Sawad*, from Tikrit to Basrah, suffered from the serious decline. Silts were never dredged as before, and the canal breeches were not repaired in time, or if this was done, it was only after long delays resulting in the ruin of the crops, flooding and damaging of the lands.

The recurrence of the same breaches was due to the poor and careless manner in which the repairs were done. Examples can be found in the many canal systems taking off from the Euphrates and irrigating the lands from *Falluja* down to lower *al-Sawad* around *Kufah*, which were described in details in the previous chapters. The *Old Diyala Dam* had already collapsed in the year 912. This resulted in the return of the Diyala River to its original course so it was threatening Baghdad with its floods. Moreover this event had caused cutting off most of the water supply that was irrigating the lands to the south and east of the Diyala River around towns like *Bajisri*, *Jarjaraiyeh*, *Der al- Agul*, *Hawlayya* and *Askaf Abi el-Jund*. All these suffered from water shortage, but they were completely ruined after the collapse later on in 1228 of the temporary dam on the Diyala River that was called *Masn'at- Suhyla*, which was mentioned previously.

The upper part of the *Nahrawn* and its *Katuls* remained in service in the early *Seljuk's* times but suffered of the transgressions describe. The main *Nahrawn* artery suffered of major breechings in 1140 and again in 1143, in addition to the other breaches caused by the troop's movements, and little was done to return the canal to its former state.

Muslim scholars contemporary to the *Seljuk* period gave us in their writings many examples of damages that were suffered by the irrigation works and were left without repair, which can be described as clear examples of carelessness and negligence. Some of these examples were observed in the destruction of the *Nahr al- Dujail* canal intake structure in the flood of the Euphrates of 1082 and the

ruin of the canal itself that was left without repair. The canal had irrigated the lands from *Falluja* down to the northwestern boundaries of west Baghdad and had served agriculture in this area. Another example is the *Nahr Isa canal* which was so vital to Baghdad and its surroundings. This canal had suffered from the damage of its intake many times by the flooding of the Euphrates, and finally remained in ruins since 1072. It was not important only because of irrigation but it also supplied the city with its drinking water and served navigation between the Euphrates and the Tigris; and when it dried up, it dealt severe blow to this prosperous area and to Baghdad itself and caused real economic catastrophe. One more flood in 1075 caused cutting off the water supply to *Nahr Nil* canal, which was a main branch of the *Sura* canal that served the middle *Sawad*, and this again caused the complete ruin of the crops and mass migration of the population⁽⁵⁶⁾.

The *Seljuk* period was also characterized by the deterioration of many of the prosperous agricultural districts and towns in the whole of *al- Sawad*. Specific examples can be mentioned such as the *Nahrawn Tusuj*, the *Khurasan* road districts, *Baquba* and *Jalawla* towns, *Baduraya*, *Sarsar*, *al- Dahiriya*, and many more beyond count, which were left in very poor conditions after they were very rich lands and productive of various crops ranging from grain to dates and fruit. These lands were characteristic of the whole of *al- Sward*, which used to produce main crops such as wheat, barley and cash crops in abundance. Cash crops such as cotton which was grown on a very

large scale in the lands of *Baqdari*, which was part of the *Dujail* district, was not grown any more.

In summary, the contributions of the *Seljuks* to the collapse of agriculture in *al-Sawad* were many; among these were their *Iqta's* policies and the looting practices, and the high taxes levied on the farmers. These policies had led to the abandonment of most of the productive lands of Iraq's *al-Sawad* and turned them to barren lands plagued with salinity, or covered with sand dunes.

In the administration of the State, the *Seljuks* policies were short sighted and led to decentralization and encouraged the separation of many regions. For in their attempts to reduce the management burden of these regions, they devised also another form of *Iqta'*. This was on a much larger scale than the previous *Iqta'* that was limited to the distribution of land to their soldiers and their nobility. In this new form, they went much further by granting their most prominent commanders whole regions to be governed on behalf of the *Sultans* against some fixed yearly payment or tribute. In a way, care of irrigation and agriculture in these regions were left to those governors completely. The new governors were generally *Mamluks* military commanders upon whom the *Seljuks* bestowed the royal title "*Atabeg*". In such case, the *Atabeg* became the military governor of the "*Atabikiyyh*" and the sole responsible person for its administration, tax collection, welfare and all other related matters. Under such a condition the *Atabikiyyhs* became in the end semiautonomous states within the *Seljuk* state, in which ruling

became hereditary and new dynasties of previously *Seljuk Mamluks* appeared. Of these “*Atabikiyyhs*” in Iraq were the Mosul *Atabikiyyh*, Erbil *Atabikiyyh* and Sinjar *Atabikiyyh*.

This form of *Iqta*’ started to spread after the death of *Sultan Malik Shah* in 1012 and many of the *Atabikiyyhs* were established within the *Seljuk State* outside Iraq also. The *Attabegs* of these semi-autonomous states took advantage of the disputes between the *Sultans* to strengthen themselves and break away from the *Seljuk State* itself, which in the end was torn apart and collapsed⁽⁵⁷⁾.

The *Iqta*’ system, although meant in the beginning to reduce the administration burden of the central government, it did not do much to improve the agriculture of *al- Sawad*. It did not help, either, in the repair of the already decaying irrigation systems, but in fact, it contributed heavily to the bankruptcy of the treasury and speeded up the final collapse of the State. This collapse came very fast on the hand of the *Khawrarzimans*, who had established their state in *Khuzestan* and western *Persia*.

In a case similar to what the *Khalifah al- Mustakfi* had done before when he had invited the *Buwayhids* to save the *Khilafa* from the tyranny of the *Turks*, the *Khawrarzimans* *Sultan Shah Tagish* took the opportunity presented to him by the message of the *Khalifah Al Nasir* (1180- 1225), who had asked for his help to relief the *Khalifah* from the *Seljuks*. Therefore, the *Khawrarzimans* troops advanced west towards the *Rayy* in *Faris* heading towards Baghdad, and they met the *Seljuks*’ army under *Sultan Tughrul III* who was killed in the

subsequent battle in 1194. However, to the bad luck of the *Khalifah Al Nasir*, he only exchanged one occupation by another one.

The new dynasty did not last long as they were vanquished by a new wave of invaders; the *Mongols* whose original homeland was in *Mongolia* in central Asia, who had risen to prominence under *Genghis Khan*. In their push into neighboring territories, they invaded the *Khawrarzimans*' state in the year 1209.

Genghis Khan's grandsons *Munker Khan* and *Hulagu Khan* continued their grandfather advance to the west, and *Hulagu* entered Baghdad on 10 February 1258 against very weak resistance offered by the last *Abbasid Khalifah al- Musta'sim* announcing the end of the *Abbasid Khilafa*⁽⁵⁸⁾.

The *Mongols* invasion put an end to thousand years of civilization and completed the devastation of the rich heritage of science, literature and arts, and destroyed in the same way what was left of the prosperity that was enjoyed by the *Mesopotamians* for thousands of years; a prosperity which was the gift of the two great rivers, Tigris and Euphrates. However, the fact remains that in the two and a half centuries of *Buwayhid* and *Seljuk* supremacy, the major part of this destruction happened; and as far as irrigation and agriculture are concerned this was due to gross negligence and unwise policies. The recurrent major uncontrolled floods, famines caused from food shortage, and the resulting epidemics were only natural results and characteristic for this period. The whole of Iraq's *al-Sward* was mostly ruined and depopulated from around the end of the

eleventh century and as correctly stated by Robert Mac Adams for this historical period by saying:

“History of this land is full of frequent mention of towns and villages that could be described as kharabat “ruins” (59).

The Mongols, however, were only instrumental in the delivering the final blow, and they finished the series of failures of the late *Khalifahs*, together with *Buwayhids* and *Seljuks*.

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Epilogue:

In more than six centuries which followed the fall of Baghdad to the hands of *Hulagu* and his *Mongol* troops in 1258 until the establishment of the modern state of Iraq in 1920. The timeline of the country cannot be described but only as a sequence of tragic events in which this once most prosperous land sank into unending bloodsheds, destruction, constant retrogression and deep poverty. Calamities such as flooding, epidemics, locusts and famines did not spare millions of its population, and to speak of Baghdad only, the 1,000,000 who used to live there in the golden days of the *Abbasids* dwindled to merely few thousands at the turn of the twentieth century.

The early stage of this severe collapse was due to the interference of the *Mongols* with the irrigation systems on which the life of people had depended. Admitting that the damage that was sustained during the *Buwayhids* and *Seljuks* times left these systems in dilapidated and bad conditions, but the *Mongols* managed to add more destruction so that agriculture diminished to small plots of lands, which could not keep up the large population anymore and made any effort of reform nearly impossible. Borrowing from the words of Stephen Hemsley longrigg in his book “*Four Centuries of Modern Iraq*” he says:

“Most ruinous of *Holagu*’s acts had been the studied destruction of the dykes and head works, whose ancient and perfect system had been the sole source of the wealth. Disordered times, and the very silting and scouring of the rivers once let loose, soon made the

restoration of control the remote, perhaps hopeless problem today still unsolved”(1).

The repeated occupations of Iraq during the following centuries by various competing external forces of *il- Khans, Jalairs Mongols*, two short lived *Turkoman dynasties, Persians and the Ottomans* made of Iraq the theater of violence and lawless land where proper management and administration were lost. It became possible for any peasant to make a breach in the bank of a canal to irrigate his plot of land even without thinking of his next door neighbor, which had in many instances triggered fighting and bloodshed between two clans. In so doing, this peasant was unconscious of breaking any law and maybe not even thinking of the danger of not being able to control the breach leading to the complete failure of the dyke and letting loose of the stream.

The absence of central government overlooking the affairs of the country, which had become now in the periphery, led to negligence of basic requirements necessary for the upkeep of its environment. Recurrent flooding of the two rivers had become beyond the control of the local authorities. The added silting and scouring of their beds made these rivers unmanageable, while existing control structure was ruined and any attempt to construct new barrages or weirs became impossible; to this, the example of the Hindiya Barrage on the Euphrates may be cited. As the attempts of construction of this Barrage at the late days of the Ottoman occupation were met with

many failures in spite of the need to keep agriculture in the middle Euphrates region going⁽²⁾.

Such situations were becoming possible due to either lack of competence and resources, or just indifference and carelessness. Security conditions became precarious throughout the country, and vast lands were depopulated while cities and towns shrunk into clusters of humble dwellings and shabby markets enclosed within narrow boundaries where the splendors of the palaces and lively centers of the previous times were lost forever. Foreign travelers passing through the country during these times witnessed to this and recorded their impressions of the wide stretches of barren lands and poor towns. An example may be given from the narrative of the Frenchman Tavernier in the 17th century, who in his journey from Aleppo to Esfahan by the way, of desert, which he made in 1638, passed through Kufah and described its water supply which as he mentioned was of three wells of brackish and stinking water and a dry canal⁽³⁾.

The open and deserted lands of the country were so much inviting to the nomadic tribes from the steppes of Nejd who were under pressure from the Wahabi religious movement at the beginning of the 18th century forcing them to cross the Euphrates to pasture in Iraq. The grazing grounds turned then to open fields of inter-tribal feuds on one hand, and to fight with the Ottoman Phashas on the other.

Late in the nineteenth century, Felix Jones and Dr John Ross, the two British travelers who traversed the land between Kut and

Samarra, which had been the most fertile lands of the old Nahrawn project, described the area as decaying and uninviting barren land(4):(5).

Iraq was long since it became habitual to disorder; to poverty and bloodshed, in which time the country had sunk into tribalism, insecurity and dependence when change occurred again. The fall of the Ottoman Empire at the beginning of the twentieth century and the occupation of Iraq by the British in 1918 opened window for the country to come in touch with civilization again. The establishment of the modern state of Iraq in 1920 made this possible, and a new phase of revival began, not in agriculture and construction of irrigation schemes only, but in all other aspects of life.

By the end of the seventies of the last century, Iraq was ranked at the top of the so-called developing countries list surpassing even Turkey and Iran in the standard of living. It is regrettable. However, that wars and economic embargo that took well over two decades since 1980 followed by what was erroneously called “the Libration of Iraq” in 2003 brought a new era of chaos, anarchy, corruption and disagreements between the new political parties which threaten the country and may revert it back to yet another cycle of retrogression.

The humble intention of the author of writing this book is to invite the reasonable people of Iraq to read their history well and to learn from its lessons, and as already been said in the dedication in the first page recalling the words of Confucius “Study the Past if you define the Future”

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